FISCAL YEAR 2000
ENVIRONMENTAL ASSESSMENT
AND
FINDING OF NO SIGNIFICANT IMPACT

MARYS PEAK RESOURCE AREA
SALEM DISTRICT OF BUREAU OF LAND MANAGEMENT

EA NUMBER:OR080-1999 -10
PREPARED BY: Roy S. Majewski

SUMMARY: Alternative A, the proposed action, would include a timber sale, enhancement of riparian reserves, and road construction, renovation and improvement in the Marys Peak Resource Area. The Duffy Creek Timber Sale, tract number OR080-TS2000-304, would remove approximately 5 to 6 million cubic feet (CCF) of merchantable timber from approximately 248 acres of land in accordance with the *Salem District Resource Management Plan* and the *North-west Forest Plan*. The average age of conifers is 40-65 years. Approximately 115 acres of upland matrix (General Forest Management Area [GFMA]) and 140 acres of Riparian Reserves would be thinned by commercial thinning and density management practices. Approximately 0.60 mile of road is proposed for new construction, 2.0 miles for renovation, 0.60 mile for im-provement and 1.3 miles for closure by gating or barricading. Reduction of landing logging debris and road blocking would also be part of the proposal.

Alternatives B and C differ only in respect to Unit 1. Alternative B would exclude approxi-mately six acres of Unit 1, require approximately 1,200 feet of new road and be entirely skyline logged. Alternative C would be the same as Alternative A except that it would add approxi-mately 15 acres, some of which would be ground-based logging, and require an additional 900 feet of new construction. Alternative D would defer treatment entirely.

The proposal would be located in Sections 7 and 17, T. 13 S., R. 6 W., Willamette Meridian, Benton County, within the Beaver Creek watershed, Willamette Province. This environ-mental assessment focuses on the following issues identified through scoping and by an inter-disciplinary team of BLM resource specialists:

* Vegetation: Effects on general vegetation, special status, special attention and other plant species and habitats, native plant species, noxious weeds, fuels buildup, and wildfire hazard;

* Soils: Effects on soil structure, stability, and long-term site productivity;

* Water/Fish/Riparian: Effects on stream flow, channel conditions, and water quality; effects on the impediment and/or prevention of attainment of the stream flow and basin hydrology, channel function, or water quality objectives of the Aquatic Conser-vation Strategy;

* Wildlife: Effects on special status, special attention and other wildlife species and their habitats;

* Air Quality: Effects on air quality;

* Recreation/Special Forest Products: Effects on off-road vehicle use and special forest products.

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FINDING OF NO SIGNIFICANT IMPACT

INTRODUCTION

The Bureau of Land Management has analyzed the potential effects of timber harvest, riparian enhancement and road construction activities in the Marys Peak Resource Area, Beaver Creek watershed. The actions described in the environmental assessment (EA) for the Duffy Creek Project are proposed for the intent of meeting the need for forest products and forest habitat as described in the *Salem District Resource Management Plan* (RMP, 1995, pp. 1 and 2). The EA is attached to and incorporated by reference in this Finding of No Significant Impact determination.

The Finding of No Significant Impact, the proposal, and associated design features described in the EA will be made available for public review prior to making a decision on the action. The public notice of availability for review will be published in a legal notice by local newspapers of general circulation and through notification of individuals, organizations, and state and federal agencies with affected interests.

Finding Rationale:

Under the alternatives analyzed, significant impacts on the quality of the human environment would not occur based on the following criteria:

1. The alternatives are in conformance with the following documents which provide the legal framework for management of BLM lands in the Marys Peak Resource Area:

- *Salem District Record of Decision and Resource Management Plan* (RMP, May 1995).

- *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement* (PRMP/FEIS, September 1994).

- *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (ROD, April 1994) and the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (SEIS, February 1994).

- *Western Oregon Program - Management of Competing Vegetation Final Environmental Impact Statement* (February 1989) and *Record of Decision* (August 1992).

The following table shows how this action relates to required components of the Aquatic Conser-vation Strategy (RMP, pp. 5-7):

Component	Relationship of This Action
Riparian Reserves	For all alternatives, management in accordance with management actions/direction on page 11 of the RMP: *"Apply silvicultural practices for riparian . . ."*
Key Watersheds	Not in a Key Watershed.
Watershed Analysis	The first iteration of the *Benton Foothills Watershed Analysis* was completed in 1997. Density management to promote future potential coarse woody debris recruitment and accelerated devel-opment of older forest characteristics was identified on p. 127.
Watershed Restoration	Thinning upslope portions of riparian reserves would restore structural diversity and complexity of understory components. New road construction in riparian reserves would be decommis-sioned after harvest (alt. B).

The action would be consistent with the Aquatic Conservation Strategy Objectives and promote development of older forest characteristics in the riparian reserves (See Appendix B-2, "Aquatic Conservation Strategy Objectives Review Summary").

2. The proposals would be located in matrix and riparian reserve lands as described in the RMP.

3. The alternatives are consistent with other federal agency and state of Oregon land use plans and with the Benton County land use plan and zoning ordinances. Any permits associated with the implementation of this project would be obtained and requirements would be met.

4. There are no flood plains, or prime or unique farmlands within the sale area.

5. No threatened or endangered plants, animals, nor cultural or paleontological resources were observed in the area. The Duffy Creek Project was submitted for formal consultation with U.S. Fish and Wildlife Service on Aug. 3, 1998 (Service Log # 1-7-98-F-361). Consultation was concluded on Oct. 23, 1999. As a result of consultation, the U.S. Fish and Wildlife Service found that the sale would not likely jeopardize the continued existence of the spotted owl. The proposal carries forward and will be covered by this year's Biological Opinion # 1-7-99-F-476, received on Oct. 26, 1999. The Upper Willamette River steelhead and Chinook salmon are not present in the entire Mary's River drainage.

Consultation with the National Marine Fisheries Service will not be conducted due to the fact that anadromous fish do not access the Marys River watershed; therefore this project will have no effect on listed fish within the Willamette River Province.

The first year of the two-year survey protocol for marbled murrelets was completed in 1999; no murrelets were detected. If in 2000, marbled murrelet surveys determine presence in or adjacent to units 2, 4, 5, or 6, then additional surveys to determine any occupational behavior would be completed. If it is determined that nesting is occurring in any of the late-seral or old-growth trees in or adjacent to the units, then those trees will be buffered to protect their nesting quality.

6. No hazardous materials or solid waste would be created in the sale area.

7. The sale area does not qualify for potential wilderness nor has it been nominated for an Area of Critical Environmental Concern.

8. Streams, ponds and wetlands exist in some of the units. The riparian reserve guidelines on page 10 of the RMP would be applied to each of these.

9. Project design features would assure that potential impacts to water quality would be in com-pliance with the State of Oregon In-stream Water Quality Standards and thus the Clean Water Act.

10. The smoke generated from burning piles would be within the standards set by the Oregon Smoke Management Plan. This plan considers national air pollution standards and complies with the Clean Air Act.

11. In accordance with the RMP (see pp. 21-22), the amount of late successional forest (i.e., 80 years and older) on federal lands was determined for the Marys River Watershed. This fifth-field watershed extends from Hammer Creek in south Benton County to a point well north of Marys Peak. The 80+ forest age classes occur on approximately 34 percent of the federal lands. This exceeds the RMP standard of 15 percent.

12. Any final decision on this project will be in conformance with the Record of Decision - *Supplemental Environmental Impact Statement For Amendment to the Survey and Manage, Protection Buffer, and Other Mitigating Measures Standards and Guidelines,* which is expected in June of 2000. The *Draft SEIS* is now available for public review until March 3, 2000.

The actions are local in nature; potential adverse impacts would be short-term. Impacts were determined based on research, observation, professional training, and experiences by the inter-disciplinary team of natural resource specialists. Determining such environmental effects reduces the uncertainties to a level that does not involve highly unknown or unique risks. The design features identified in the EA would assure that no significant site-specific nor cumulative impacts would occur to the human environment other than those already addressed in the FEIS and SEIS.

Finding of No Significant Impact Determination

Based on the analysis of information in the attached EA, my determination is that a new environmental impact statement (EIS) or supplement to the existing FEIS is unnecessary and will not be prepared. The proposed project would not result in significant environmental impacts affecting the quality of the human environment greater than those addressed in the documents listed above.

John P Sucklo

MARYS PEAK RESOURCE AREA FIELD MANAGER

12-16-99

DATE

Comments regarding this environmental assessment should be received by the Bureau of Land Management, Marys Peak Resource Area by January 17, 2000.

Duffy Creek Timber Sale
Environmental Assessment
December 1999

TABLE OF CONTENTS

APPENDICES:

I. PURPOSE AND NEED

A. Introduction

The proposed management activities would be located in Sections 7 and 17, T.13 S.,R. 6 W., W.M., Benton County, within the Beaver Creek watershed (see General Vicinity Maps in Appen-dix A-1). The project area is approximately ten miles southwest of the city of Philomath. The actions would occur on lands classified as Matrix and Riparian Reserves in the RMP on pages 9 and 20. The Matrix land use allocation allows for harvesting of trees while retaining important ecological components of forest stands. The Riparian Reserve land use allocation provides for maintaining or enhancing the Aquatic Conservation Strategy Objectives that are listed on pages 5 and 6 of the RMP and Appendix B-2 of this EA.

The action described and analyzed herein is proposed for the purposes of meeting the need for forest products and forest habitat as described in the *Salem District Resource Management Plan* (RMP, 1995, pp. 1 and 2). The proposed project would provide a supply of timber and other forest products that would help maintain the stability of local and regional economies. The pro-posal would also provide for retention of important ecological components within the forest man-agement area. The project would accomplish road restoration and riparian enhancement in a manner that meets the Aquatic Conservation Strategy Objectives outlined in the Northwest Forest Plan (1994).

The objectives of the matrix thinnings are to remove those trees likely to die in the future due to increasing stand densities resulting from stand growth. The thinning would serve to concentrate the sites' productivity on fewer stems, resulting in a higher quality end product. This would be reflected in future higher product value for the public.

The *Benton Foothills Watershed Analysis* (September 1997) found that "Large woody debris potential is currently low because the Riparian Reserves lack stands older than 80 years" (p. 66) and recommended that it "will be necessary to leave [provide for] most of the hard snags and down wood as green trees in order to provide for large CWD over the life of the stand and em-phasize long-term treatment prescriptions to achieve CWD . . ." (p. 127). The density manage-ment of approximately 150 acres of Riparian Reserves in Units 1 through 6 would be imple-mented to meet those goals and also to enhance the growth of trees in the riparian reserve (p. 77).

This environmental assessment (EA) is tiered to the *Salem District Record of Decision and Re-source Management Plan* (RMP May, 1995) and the *Salem District Proposed Resource Manage-ment Plan/Final Environmental Impact Statement* (PRMP/FEIS, September 1994). The FEIS analyzed broad scope issues and impacts within the Northwest Forest Plan's direction to meet the need for forest habitat and forest products (p. 1). The RMP provides a comprehensive ecosystem management strategy for BLM-managed lands in the Salem District in strict conformance with the Northwest Forest Plan and the *Record of Decision for Amendments to Forest Service and Bureau of Land*

Management Planning Documents Within the Range of the Northern Spotted Owl (April 1994).

This environmental assessment is also tiered to the *Western Oregon Program-Management of Competing Vegetation Final Environmental Impact Statement* (VMFEIS, February 1989) and the *Western Oregon Program-Management of Competing Vegetation Record of Decision* (August 1992). The VMFEIS analyzed broad scope issues and impacts for an integrated vegetation management strategy consisting of various treatments. The Record of Decision identifies treatments and provides processes to meet vegetation management objectives (p. 3) and resource manage-ment goals (p. 33). This EA will analyze vegetation management treatments such as severance of unmerchantable stems as they relate to site preparation and reforestation of harvested units. This EA is a site-specific analysis.

The above documents are available for review in the Salem District Office. Additional informa-tion about the proposed Duffy Creek project is available in the Duffy Creek Project EA file.

B. Scoping

Public involvement efforts during the scoping process included the following:

* The general area was shown as Matrix in the Northwest Forest Plan and the RMP. These documents were widely circulated in the state of Oregon and elsewhere, and public review and com-ment were requested at each step of the planning process.

* A description of the proposal was included in Salem Bureau of Land Management *Project Up-date* issues mailed in December 1998 and March 1999 to more than 900 individuals and organi-zations on its mailing list.

* A letter asking for input on the proposal was mailed on April 21, 1999 to adjacent landowners and individuals or organizations who have expressed an interest in management activities in the resource area as a whole or in this drainage. Letters were also sent to the Benton County Board of Commissioners, Oregon Department of Forestry, Oregon Department of Fish and Wildlife, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the Associated Oregon Loggers, Inc. No written responses to this scoping letter were received.

C. Management Objectives by Land Use Allocation and Resource Program

The objectives listed below can be found on the pages indicated in the RMP.

General Forest Management Area (p. 20)

1. Produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability.
2. Provide connectivity (along with other allocations such as Riparian Reserves) between Late Successional Reserves.
3. Provide habitat for a variety of organisms associated with both late-successional and younger forests.
4. Provide for important ecological functions such as dispersal of organisms, carry-over of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees.
5. Provide early successional habitat.

Riparian Reserves (p. 9)

1. Meet Aquatic Conservation Strategy Objectives
2. Provide habitat for special status/attention and other terrestrial species.

Air Quality (p. 22)

1. Maintain and enhance air quality in a manner consistent with the Clean Air Act and the State of Oregon implementation plan**.**

Water and Soil Resources (p. 22)

1. Comply with state water quality requirements to restore and maintain water qual-ity and to protect recognized beneficial uses in watersheds.
2. Improve and/or maintain soil productivity.

Special Status and SEIS Special Attention Species (p. 28)

1. Protect, manage and/or conserve habitat for these species so as to not elevate their status to any higher level of concern.

II. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

A. Introduction

This section describes the proposed action and reasonable alternatives identified by the interdis-ciplinary team that developed the Duffy Creek Project Proposal. Forest management treatments incorporated in the proposed action and alternatives conform with standard practices and general design features intended to reduce the environmental effects of timber harvest and related activ-ities. They comply with the Standards and Guidelines specified in Appendix A of the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Docu-ments Within the Range of the Northern Spotted Owl* (April 1994). These measures are described in Appendix C, "Best Management Practices and Timber Production Capability Classification Fragile Code Guidance" in the *Salem District Resource Management Plan* (May 1995). Copies of these documents can be obtained in the Salem District Office.

B. Alternatives Considered But Eliminated

Approximately 21 to 61 acres were considered for commercial thinning or density management but not recommended by the ID Team because of:

* Aquatic Conservation Strategy objectives conflict
* Riparian Reserves not needing treatment
* Survey and Manage Retention Areas
* Owl/murrelet reserves
* Inoperable ground

C. Scoping Issues

The issues listed below concerning the proposed action and alternatives were identified through public scoping and by an interdisciplinary team of BLM natural resource specialists representing various fields of science (see section VI., List of Preparers/Interdisciplinary Team Members). Issues that were considered but eliminated from analysis are documented in Appendix C-1, Environmental Elements Review Summary.

- Vegetation: Effects on general vegetation, special status, special attention and other plant species and habitats, native plant species, noxious weeds, fuels buildup, and wildfire hazard

- Soils: Effects on soil structure, stability, and long-term site productivity

- Water/Fish/Riparian: Effects on stream flow, channel conditions, and water quality; effects on the

impediment and/or prevention of attainment of the stream flow and basin hydrology, chan-nel function, or water quality objectives of the Aquatic Conservation Strategy

C Wildlife: Effects on special status, special attention and other wildlife species and their habitats

C Air Quality: Effects on air quality;

C Recreation/Special Forest Products: Effects on off-road and special forest products use

D. Summary of Alternatives

1. Alternative A: The Proposed Action

Commercial thinning in matrix (officially known as General Forest Management Areas [GFMA]) and density management in riparian zones would be done on approximately 115 and 133 acres, respectively. Trees 40-65 years old would be skyline yarded on approximately 92 acres and ground-based yarded on approximately 156 acres. Stand diversity as required in the ROD/RMP would be retained. The project would be consistent with the Aquatic Conservation Strategies in the ROD/RMP. Approximately 3,200 feet of new road would be constructed. The Project Design Features which follow provide further details.

a. Project Design Features

Project design features are operating procedures that would be included in the design and implementation of the proposed action alternative. They also include measures proposed to mitigate adverse environmental effects. The design features of this proposal are described below. All acres and other numerical units are approximate (See Appendix A-2, Maps of Proposed Action and Design Features Tables, for the proposed action and all alternatives).

i. Air Quality

- Logging slash and brush would be burned only under conditions which comply with state and federal air quality guidelines.

ii. Timber Harvest

- Residual and harvest trees would be treated as follows:

    - Remove approximately 90 to 138 green conifer trees per acre in units 1, 2, and 5 and approximately 214-223 green conifer trees per acre in units 3, 4, and 6. The average leave DBH is 14-16 DBH with approximately 18 to 21 foot spacing (see silvicultural

prescription in the project EA file). This removal includes both up-lands and riparian reserves.

- Remove unmerchantable conifers 5 to 9 inches DBH only in unit 3, upland matrix.
- Except for rights-of-way (ROWs) or for safety reasons, all grand fir, western red cedar, Pacific yew, and hardwoods would be reserved in all units. Some western hemlock would be reserved in riparian reserves.
- Except for ROWs, reserve from removal in all units all conifers 20 DBH and larger and all coarse woody debris.
- Where appropriate and especially in riparian reserves, mark additional leave trees to serve as protection around snags.

- Yarding with ground-based equipment would be restricted to periods of low soil moisture, generally between July 15 and October 15.
- Waterbars would be installed where they are determined to be necessary by the Authorized Officer.
- All yarding would be restricted to periods of low sap flow, generally between July 15 of one calendar year and April 15 of the next.
- Mature reserved green trees and snags that constitute a safety hazard would be cut and left.
- Logs would be yarded with a skyline cable system on 92 acres (37 percent of total harvest area) and a ground-based system on 156 acres (63 percent of the total harvest area).
- In the skyline yarding area, one end suspension of logs would be required over as much of the area as possible to minimize soil compaction, damage to reserve trees, and disturbance. Yard-ing corridors would average 150 feet apart where they intersect boundaries and be 15 feet or less in width. Lateral yarding up to 75' from the skyline, using an energized, locking carriage would be required. Where necessary, skyline yarding over streams would require full suspen-sion.
- Ground-based, track-mounted equipment may be used on slopes less than 35 percent and op-erate where practical on top of slash. Small crawler yarding equipment with an integral arch and less than 96 inches in width would utilize pre-designated skid roads spaced at least 150 feet apart. Shovel yarders and harvester/forwarders may also be utilized, with approximately 60 foot spacings between shovel/harvester/forwarder roads.
- Where necessary, disturbed soil on ground-based yarding areas would be seeded with Oregon "Blue Tag" certified noxious weed-free red fescue.

- To facilitate skid trail and skyline corridor yarding, existing down logs would be cut at a bevel and pushed to the side in a manner that would not damage residual trees.

- Log landings would be constructed approximately 150 to 200 apart; landings would be exca-vated in order to accommodate a fixed boom yarder.

- Where necessary, all trees within one tree height of no cut stream buffers would be felled directionally away from streams. If trees fall into the no cut stream buffer, only that portion outside of the no cut buffer would be removed.

iii. Road and Landing Construction, Road Management

- Approximately 3,200 feet of new road, located predominantly on or near ridgetop locations, would be constructed. Where grades are less than 8 percent, outslope roads with no ditches would be constructed. Grades over 8 percent would be constructed with ditches, and depend-ing on gradient, cross drains would be installed at intervals not exceeding 400 feet.

- In order to limit soil erosion, road construction would be restricted to periods of low precipi-tation (generally May through October).

- Road construction length and width and landing construction would be minimized.

- Timber hauling would be allowed year-round on rock surfaced roads. In periods of high rain-fall, the contract administrator may restrict log hauling to minimize water quality impacts, especially if sediment transport is imminent. Silt fences and hay bales would be installed if necessary to control sediment transport

- All proposed new construction used for skyline logging would be surfaced in order to provide for all season logging and hauling.

- Following harvest, three new and/or existing roads in the project area would be closed to pub-lic vehicular use (see Appendix A- 4, Alternative A). Where practical, skid roads near land-ings would be blocked with landing debris to deter off-road vehicle use.

- Areas of exposed soil within all new road construction, including cut banks, fills, and land-ings, would be seeded with 40 pounds of certified (Oregon Blue Tag Certified) noxious weed-free red fescue.

(See Appendix A-4, Design Features - Roads, for more detailed information and a summary of road activities.)

iv. Survey and Manage and Protection Buffer Species for Plants and Wildlife

- Five blue-grey and papillose tail dropper mollusks, in accordance with management recommendations for mollusks dated Oct. 15, 1999, would be protected with a 100-foot radius no-entry, no thin buffer. All coarse woody debris and all hardwoods, except for ROWs, would be left on site (see Wildlife Biological Evaluation Impacts in Appendix B-1 for management of known sites).

- Protection buffer species sites would be protected, in accordance with management recommendations for fungi dated Oct. 20, 1997. Harvesting operations within these sites would be prohibited.

- Any final decision on this project will be in conformance with the Record of Decision - *Supplemental Environmental Impact Statement For Amendment to the Survey and Manage, Protection Buffer, and Other Mitigating Measures Standards and Guidelines,* which is expected in June of 2000. (The *Draft SEIS* is now available for public review until March 3, 2000.)

- If other special attention species or special status species are discovered on site, appropriate mitigation would be implemented as described on pages 28-33 of the RMP.

- If in the year 2000, marbled murrelet surveys determine presence in the area, additional sur-veys to determine occupational behavior would be completed. If it is determined that nesting is occurring in any late-seral or old-growth trees in or adjacent to units 2, 4, 5, or 6, then those trees would be buffered to protect nesting quality.

- Felling, yarding and road building activities would be restricted from March 1 to June 1 to minimize noise disturbance to nesting owls.

- If murrelet surveys determine presence, all operations in Section 7 would be restricted be-tween June 6 and August 5 during the period of two hours prior to sunset and two hours after sunrise.

- To reduce impacts to spotted owl foraging habitat, holes or patch cuts in the overstory canopy would be minimized.

v. Soils

- Soils management design features are listed under the Roads, Timber, Water/Riparian/Fish and Wildlife sections.

vi. Site Preparation

- Landing slash would be piled with a hydraulic loader, covered in late summer, and burned in the fall under favorable smoke management conditions.

- Harvest of floral greenery, transplants, and other Special Forest Products (SFP) would be per-

mitted before and after harvest operations. If firewood is present on landings after logging completion, permits would be available to the public.

vii. Water/Fish/Riparian

- To protect water quality, trees would be felled away from streams.

- To provide for adequate suspension, some trees located within the riparian reserves and no entry, no thin tree zones may be topped for tail trees. Tops would be reserved and not re-moved from the site. (see Appendix A-3)

- Three years after timber sale completion, after evaluating size and condition of CWD and snags, one tree per acre of average or larger DBH size class would be cut and left for CWD. Where appropriate, up to 2 snags per acre of average or larger DBH size class would be created. (see Appendices B-4 and B-5)

- Logging activities would be permitted in the riparian reserves, but not within the variable width areas (stream protection zones) reserved adjacent to streams.

- If 1999 or 2000 marbled murrelet surveys determine presence, additional surveys would be completed to determine occupational behavior. If nesting is occurring in any late-seral or old-growth trees, they would be buffered.

2. Alternative B

This alternative would be the same as Alternative A, including project design features, except that approximately six acres of Unit 1 would be deferred for future treatment, and the entire unit would be skyline logged, requiring an additional 1,200 feet of road for yarder access. This new construction would not be surfaced and would be ripped and barricaded upon completion of logging. Approximately 1,100 feet of road renovation/improvement (needed for Alternative A but not for B) would be dropped. (See Appendix A-2, Alternative B map.)

3. Alternative C

This alternative would be the same as Alternative A, including project design features, except it would add 15 acres and 900 feet of new road to Unit 1. This new road would have the culvert removed and road ripped upon completion of logging. This additional area would be skyline and ground-based yarded. Approximately 5 acres of this additional area is special habitat for *Otidea onotica* and *Sarcosoma mexicana*, both protection buffer fungus species. Each site would require no entry, no thin type buffers. (See Appendix A-2, Alternative C map.)

4. Alternative D: No Action

Thinning and density management in sections 7 and 17 would be deferred to a later date.

III. DESCRIPTION OF THE AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES

The following descriptions are the environmental features affected by timber harvest and asso-ciated activities and the environmental consequences which would result from implementing the alternatives. (This information is summarized in Appendix C-1.) If there are no anticipated site-specific impacts, if site-specific impacts are considered negligible, or if the cumulative impacts described in the PRMP/FEIS are considered acceptable, then resource values are not described in this section. A documentation of "no effect" to resources where review is required by statute, regulation, or executive order is included in Appendix C-1. (See *BLM Manual*, Sec. 1790, Appendix 5.)

A. General

The proposed project area is located in T. 13 S., R. 6 W., Sections 7 and 17, in Benton County. The action falls within the Benton Foothills Watershed Analysis Area, and the land use alloca-tion is Matrix (GFMA) and Riparian Reserve.

B. Topography

The project area is represented by multiple aspects on slopes generally ranging from 0 to 40 percent, with some smaller areas approaching 80 percent. Elevation varies from 500 to 1,500 feet.

C. Air Quality

Issue: Effect on air quality in designated areas.

Air Quality: Affected Environment

The town of Philomath is approximately ten miles northeast of the proposed harvest area. Scat-tered rural residences are located nearer the harvest area. The state regulates forest burning in order to minimize entry of smoke into residential areas.

Air Quality: Environmental Consequences

Burning of slash piles would create smoke. Burning would be conducted in accordance with state regulations, and since burning of slash piles would be done in the fall under good atmos-pheric mixing conditions, impact to air quality in designated areas would be very low. These consequences would be the same for all action alternatives**.** The no action alternative would result in continuation of current air quality conditions.

D. Vegetation

Issue: Effects on maintaining long-term productivity, forest health and biodiversity.

Vegetation: Affected Environment

Except for Unit 5, the majority of this proposed thinning is dominated by a 40 to 65 year-old stand of Douglas-fir. The canopy closure is approximately 80-90 percent in areas dominated by Douglas-fir. Western hemlocks, western red cedars, Pacific yews, big-leaf maples and red alders are common throughout the proposed units. Red alders are generally common in areas with a slightly higher water table than the conifer-dominated portion of the stands. Grand firs are lo-cated mostly in the southeastern portion of unit #3 in section 17. The understory is mostly non-existent in these stands. The dominant shrub species are (in order of abundance) salal, Oregon grape, California hazelnut and vine maple. Sword-fern is the dominant fern/forb species. Many portions of these units have open, moss-covered (*Eurhynchium oreganum*) slash areas. These areas are devoid of most forb species due to the high percentage of canopy cover, which restricts available light to the ground. The major plant grouping in this project area, as listed in the *Salem District Resource Management Plan/Final Environmental Impact Statement* (RMP, V.1, Chapter 3, pp. 29-32) is the Douglas-fir/Red Alder/Vine Maple grouping.

Unit 5 is a two-story stand with approximately 18 large remnant Douglas-fir trees per acre. The understory stand in Unit 5 is approximately 65 years old, but the stocking is similar to the major-ity of the project area. Canopy closure is 80 percent, and there is little conifer seedling develop-ment. The trees in the project area are in good general health.

The table on the following page displays a range of unit stand data (see silvicultural prescription in EA file):

Timber Type	D3 / 1955 (10-12% hardwood); D4-D3 = 1935
Trees/Acre	162-325
Average DBH	12-15 inches
Average Basal Area	210-300 square feet
Average MBF/Acre	39-58 (63-93 CCF/Acre)
Crown Closure	78-97
Site Class/Index King	II/134 - III/117
Relative Density	59-77
Average CWD (ft./ac.)	1,100-3,800 (>5 inch diameter)

Noxious Weeds

The following noxious weeds (as listed by the State of Oregon's Department of Agriculture) were found within the proposed project areas: Scotch broom (*Cytisus scoparius*), tansy ragwort (*Senecio jacobaea*), Canadian thistle (*Cirsium arvense*), and St. John's wort (*Hypericum perfor-atum*).

Special Status/Attention Species

The project area was surveyed in the spring and fall of 1996, 1998, and 1999. No sites of any special status plant, bryophyte, lichen or fungi species are known to exist within the project area nor were any found. Several special attention species were found. They are listed in the attached Appendix D-1, which indicates which planning unit they were found in. There were no known sites of any special attention species prior to these surveys.

Fire/Fuels

The project area is presently occupied by fairly continuous stands of second-growth timber. There is a moderate accumulation of dead woody material on the ground. Numerous small snags are scattered through the stand. Large snags (over 20" dia.) are less than 2 per acre. Based on visual estimates, using GTR-PNW-105, series 1-DF-2, the total dead fuel loading for these stands is approximately 30 tons per acre. Fuel model for these sites would be model 8 - closed timber litter.

Vegetation: Environmental Consequences

Alternative A (Proposed Action)

New construction of three roads (3,200 ft., totaling less than one acre) would be constructed. This

would result in the removal of vegetation and mineral soil on less than approximately one acre.

Thinning approximately 248 acres would decrease the percentage of canopy cover in the project area. A decrease in the canopy density would increase the amount of available sunlight to the forest floor, resulting in accelerated growth to the reserved conifers, hardwoods, shrubs and forbs within and adjacent the project area. Some of these reserved species may be damaged through logging and road construction activities. No significant impacts to these common species are anticipated. Older forest characteristics may be achieved earlier within the stand through thin-ning. However, these stands are located in the matrix (GFMA) land use allocation and may be subject to regeneration harvest prior to becoming established as an "old-growth" stand.

The majority of the trees to be thinned are suppressed and co-dominant conifer trees. These trees would be removed and utilized in the wood products industry. Most tops, limbs and leaves would remain on site, increasing the amount of down woody material in the short-term. In the long-term, the area may be lacking down woody material, as many of the trees removed would have provided the downed woody material for these stands. Several blown down, reserved trees are anticipated post-harvest. The area may still be lacking in down woody material (post-harvest) as compared to a natural stand of this age.

Removal of damaged or suppressed trees could reduce opportunities for insect infestation and disease in the stand.

Special Status Species

The proposed action would not affect any special status plant species since none were found in or are known from the project area.

Special Attention Species

Protection buffer fungus species *Sarcosoma mexicana* and *Otidea onotica* sites, in accordance with management recommendations for fungi dated Oct. 20, 1997, would be protected by restricting operations within each site. No logging activities would be allowed in each reserve. Both of these species are fairly common in the Marys Peak Resource Area.

Cantharellus formosus, a category 1 Survey and Manage species, would not receive any special protection. DNA analysis has indicated this is the common chanterelle of western Oregon and not *C. cibarius* as once thought. This species is common and harvested commercially throughout western Oregon and western Washington. *Management Recommendations for Survey and Man-age Fungi* (September 1997) states, "It is a candidate for removal from the list of taxa of special concern because it is commonly found in disturbed, second-growth habitat across its range."

The *Helvella compressa* site was located within the aquatic system of the riparian area located in Unit

1 of Section 17. This site would be protected by the buffer on the aquatic system.

Any additional protection buffer and special attention strategy 1 and 2 species found within the project area would be protected as outlined in the Salem RMP and/or supporting documents.

All other category 3 and/or 4 special attention species would not receive any special buffers.

Noxious Weeds

The four species listed above are priority III noxious weeds and are well established and wide-spread throughout the Marys Peak Resource Area and the Salem District. Eradication is not practical using any proposed treatment methods. Grass seeding exposed soil areas tends to decrease the establishment of noxious weeds. Any adverse effects from noxious weeds are not anticipated.

Alternative B

Essentially the same impacts to the site as Alternative A, with the following differences: since Unit 1 would be cable yarded instead of ground-based yarded, there would be less soil and vege-tative damage to this stand. Road improvement/renovation of 1,100 feet would be removed from this unit. However, the additional 1,200 feet of new road construction would be required and may negate any of the above "lighter" impacts.

Alternative C

Essentially the same impacts to the site as Alternative A, with the following differences: Alter-native C would increase the sale area by 15 acres but would only net nine acres identified for thinning. Six acres out of the 15 acres would provide protection to the six sites of *Otidea onotica* and to the one *Sarcosoma mexicana* site located within this alternative. However, both of these fungus species are fairly common in the area as well as within the Marys Peak Resource area. In a proposed EIS, both species are expected to be downgraded, and therefore may not require any special buffers. This alternative would also require an additional 900 feet of new road construc-tion with one stream crossing. This area would be logged using ground-based equipment.

Alternative D: No Action (Deferred Treatment)

Trees would not be cut or removed and would remain within the ecosystem. The natural vegeta-tion in the area would not be altered and would be allowed to continue through natural succes-sion. The canopy cover in the area would remain high, limiting the amount of shrub and forb growth until natural openings in the forest occur. Down woody debris would continue to in-crease as the suppressed and some co-dominant trees die from lack of sunlight, insect infesta-tions, and/or other diseases.

Special Status Species

The No Action alternative would not affect any special status plant, fungi, lichen or bryophyte species since none were found in or are known from the project area.

Special Attention Species

All special attention and protection buffer species would be protected from any logging activ-ities. The area would continue to harbor these species and would be subjected to natural succes-sional changes.

Noxious Weeds

The same noxious weeds mentioned in the affected environment section would continue to exist along the road systems in small populations. Any populations outside of the road prism would die as the conifers mature and sunlight becomes limited.

Fire/Fuels

Alternative A (Proposed Action) and Alternatives B, C, and D

Fuel loading and fire risk will increase at this site as a result of the proposed action.

The increase in slash created by the proposed thinning would result in a higher risk of fire on the thinned sites following logging. The increase in fuel loading is expected to be 5 to 15 tons per acre, with a discontinuous arrangement. Total dead fuel loadings will range from approximately 20 to 45 tons per acre. The highest fuel loadings will be scattered through the site, depending on the distribution of trees cut with the various prescriptions. The fuel model will shift from model 8 to model 10 or 11. Due to the moderate to flat topography and the maintenance of a tree cano-py shading the fuels, the overall the risk of fire following this action would be moderate.

Risk of fire would be greatest during the period when attached needles dry out the first season following cutting. These “red needles” generally fall off within one year, and fire risk greatly diminishes. Fire risk will continue to diminish as the area greens up and the fine twigs and branches begin to break down. Any gates or berms installed to restrict traffic would help to reduce vehicle access to the site and reduce risk of a fire start. In order to further mitigate fire risk, this site should be posted as closed to all off-road motor vehicle use during the closed fire season the first year following harvest activities (i.e., while fuels are in the “red needle” stage). The area should be monitored for the need of additional closures during subsequent years during periods of high fire danger. Burning of landing piles and slash concentrations along roads would reduce risk of a fire start from human ignition sources.

Since all burning will be done in the fall under good atmospheric mixing conditions, the threat of impacting air quality in designated areas would be very low.

No action, Alternative D, would result in the continuation of current conditions at this site (i.e., timber

stand and brush would continue growing).

E. Soils

Issue: Effects on long-term soil productivity.

Soils: Affected Environment

The predominant soil series on and around these sites are Blachly clay loam (units 4, 5 & 6), Marty gravelly loam (units 1 & 2), and Honeygrove silty clay loam (unit 3). Slopes on the majority of the sites vary from generally flat on the ridgetops and benches up to moderately steep (<40 percent) slopes. There are a few small areas of steep to very steep slopes up to approxi-mately 80 percent in unit 3 adjacent to a withdrawn scarp area with a recent slide. There are a few other small areas of steeper slopes in units 4 and 5. Efforts to exclude operations on slopes over 80 percent have resulted in these areas being posted out of the units. There is an extensive network of old tractor skid trails in units 1, 2, 3 and 4. The estimated aerial extent of these skid trails in units 1 and 2 is at least 15 percent of the area, and in units 3 and 4, approximately 10 percent. Compacted soils have persisted in most of the skid trails checked. There is some brush growing in most of the trails. Large trees are present mostly along the edges of the trails; very few large trees are growing in the trails themselves. The skid trails are generally under 10 feet in width so the stands are fully occupied by tree canopies (see the soils report in the EA file for specific soil descriptions).

The slopes and soils on this proposed project area are generally stable, with moderately high to high productivity (site index III - II). Where slopes exceed approximately 70 percent, the soils become shallower and the surfaces less stable, with increasing risk for dry ravel and shallow landslides if the protective surface litter and vegetation is removed. Vegetation re-establishes fairly rapidly following disturbance on the less steep sites, but re-establishment of vegetation can be prolonged on disturbed slopes in excess of approximately 70 percent slope.

There are two major management concerns with these soils:

1) The sensitivity to compaction when wet and the subsequent reduction in the water infiltration rate when compacted. On compacted steeper sites (>35 percent), runoff rates on bare soil would be rapid and hazard of erosion moderate. Much of the proposed project site has slopes between 40 percent and 60 percent, so minimizing compaction of soils and maintaining some vegetation and litter on the surface of these steeper areas should be a high priority. Compaction of the soil also can reduce site productivity by limiting/restricting root growth in the compacted soil as well as limiting movement of O_2 and CO_2 into and out of the soil.

2) The potential for shallow landslides and dry ravel is increased on the very steep sloped areas (>70 percent) when vegetation and surface litter and debris are removed. Mainte-nance of vegetation and surface debris should be a high priority on the steeper slopes.

Soils: Environmental Consequences

Alternative A (Proposed Action)

Roads and Logging

Under this proposal, the percentage of total unit area impacted by surface disturbance and soil compaction as a result of the existing roads, landing construction, and new road construction would be approximately 4.1 percent, and yarding roads would account for 3.4 percent. The total area affected would be 7.5 percent. See Table A below for details.

Alternative B

Roads and Logging

Under this proposal, the percentage of total unit area impacted by surface disturbance and soil compaction as a result of the existing roads, landing construction and new road construction would be approximately 4.5 percent, and yarding roads would account for 3.0 percent. The total area affected would be 7.5 percent. See Table B below for details.

Alternative C

Roads and Logging

Under this proposal, the percentage of total unit area impacted by surface disturbance and soil compaction as a result of the existing roads, landing construction and new road construction would be approximately 4.1 percent, and yarding roads would account for 3.3 percent. The total area affected would be 7.4 percent. See Table C below for details.

Alternative D (No Action)

No action would result in the continuation of current conditions at this site.

TABLE A: ALTERNATIVE A SOILS

Unit #: # of Acres	Tractor Skid Roads (Acres)	Reconstructed & Existing Roads & Landings (Acres)	New Road Construction (Acres)	Skyline Yarding Roads (Acres)	Total Acres	Percentage of Unit Area
#1: 39 acs.	2.0	1.5	0	0	3.5	9.0%
#2: 70 acs.	2.7	3.2	0	0	5.9	8.4%
#3: 69 acs.	1.1	2.8	0.9	0.7	5.5	7.9%
#4: 55 acs.	0.3	0.8	0.8	1.1	3.0	5.5%
#5: 11 acs.	0	0.1	0	0.3	0.4	3.6%
#6: 5 acs.	0	0.1	0	0.2	0.3	6.0%
Total: 249 acs.	6.1	8.5	1.7	2.3	18.6	7.5%

TABLE B: ALTERNATIVE B SOILS

Unit #: # of Acres	Tractor Skid Roads (Acres)	Reconstructed & Existing Roads & Landings (Acres)	New Road Construction (Acres)	Skyline Yarding Roads (Acres)	Total Acres	Percentage of Unit Area
#1: 31 acs.	0	1.5	0.7	0.8	3.0	9.5%
#2: 70 acs.	2.7	3.2	0	0	5.9	8.4%
#3: 69 acs.	1.1	2.8	0.9	0.7	5.5	7.9%
#4: 55 acs.	0.3	0.8	0.8	1.1	3.0	5.5%
#5: 11 acs.	0	0.1	0	0.3	0.4	3.6%
#6: 5 acs.	0	0.1	0	0.2	0.3	6.0%
Total: 241 acs.	4.1	8.5	2.4	3.1	18.1	7.5%

TABLE C: ALTERNATIVE C SOILS

Unit #: # of Acres	Tractor Skid Roads (Acres)	Reconstructed & Existing Roads & Landings (Acres)	New Road Construction (Acres)	Skyline Yarding Roads (Acres)	Total Acres	Percentage of Unit Area
#1: 54 acs.	2.2	1.7	0.5	0.1	4.5	8.3%
#2: 70 acs.	2.7	3.2	0	0	5.9	8.4%
#3: 69 acs.	1.1	2.8	0.9	0.7	5.5	7.9%
#4: 55 acs.	0.3	0.8	0.8	1.1	3.0	5.5%
#5: 11 acs.	0	0.1	0	0.3	0.4	3.6%
#6: 5 acs.	0	0.1	0	0.2	0.3	6.0%
Total: 264 acs.	6.3	8.7	2.2	2.3	19.5	7.4%

For All Proposals

Most of the land within the project area with slopes <40 percent has been tractor logged, and there are still many compacted skid roads existing throughout the site. These existing roads would be used as much as practical when marking locations for skid roads for this project. As a result, the actual amount (acreage) of *new* skid roads will be much less than the totals listed in the tables above. Much of the impacted acreage listed in the above tables already exists.

Clearing of skyline yarding roads (generally about 2-3 percent of the area) usually results in light to moderate soil compaction in a narrow strip (<4 feet in width). The effect on site productivity from this type of disturbance is minimal compared to severely compacted tractor or haul roads. Several studies have reported reductions in productivity up to 40-50 on severely compacted sites. These severe reductions were also associated with significant loss and displacement of topsoil. If the suggested design measures are followed, only light to moderate soil compaction and very little top soil loss should occur. Expected productivity losses would be less than 20-30 percent for the compacted acres. At the completion of operations, ripping of some roads would mitigate at least 50 percent of the negative effects from soil compaction. However, because this project is a thinning, skid roads would not be ripped in order to avoid damage to existing tree roots. (Ripping would be used in a final harvest operation.)

F. Water/Fish/Riparian

Issue: Effects on stream flow, channel conditions, and water quality. Effects on the impediment and/or prevention of attainment of the stream flow and basin hydrology, channel function, or water quality objectives of the Aquatic Conservation Strategy.

Water: Affected Environment

Precipitation and Geology of the Project Area

The project area is located in the Oregon Coast Range foothills at elevations between 500 and 1,500 feet. This elevation range is rainfall dominated and is not normally subject to rain-on-snow events, which have the potential to increase peak flows during winter or spring storms. According to the National Oceanica and Atmospheric Agency, this area receives approximately 70-80 inches of rain annually and has a mean 2-year precipitation event of 3.5 to 4 inches in a 24-hour period.

There are two primary stream systems draining the project area: Greasy Creek to the north and Duffy Creek to the east. Both streams flow to the Marys River and ultimately to the Upper Wil-lamette "fourth-field" (U.S.G.S. cataloging unit #17090003).

The project area bedrock is composed primarily of the Tyee Formation: thick bedded sandstone and interbedded siltstone formed in a marine environment. Peaks and ridge lines in the area are generally capped by resistant intrusive rocks, primarily gabbro and diorite (so called "mafic intrusives"). Tuffaceous marine siltstones lay on the eastern edge of the project area and transi-tion to Willamette silts in the Muddy and Greasy Creek valleys.

Project Area Streams

The Greasy Creek main channel in section 7 is primarily a Rosgen B stream type (2-4 percent gradient), perennial, and in functional condition. This is primarily a step pool channel which transitions to cascades at valley constrictions. Large wood has created numerous dams with back water depositional areas and small flood plains behind them. Channel substrate is composed mostly of cobble and gravel. The main channel is constrained in a moderately steep, "V" shaped colluvial valley. Sideslopes in this valley are subject to mass wasting and small scale landslides. Some of the riparian zone immediately adjacent to the Greasy Creek channel in the project area has not been managed and represents a natural condition for this landscape. It is characterized by a multiple-storied canopy of scattered, mature Douglas-fir, western red cedar, western hemlock, big-leaf maple, red alder, and a thick understory of vine maple, salal, ferns and salmonberry. Tributary channels in section 7 are small, intermittent Rosgen type "A" channels. These chan-nels run on the surface of the deep soils in this area and have a substrate of silts and sands.

The Duffy Creek main channel in section 17 is primarily a Rosgen B stream type (2-4 percent gradient), perennial, and in functional condition. Tributary channels to Duffy are "A" channel types interspersed with Rosgen G types (gully, <4 percent gradient) at several locations where the stream has incised through the deep, slump prone soils common in this area. Substrates are gravel, sands and silt. The riparian vegetation in this section is dominated by dense stands of young Douglas-fir.

As a result of the deep soils, unusual topographic features, and moderate slopes in this section, drainage during winter storms is often slowed, and high water tables are common. These are associated with numerous small (< 1 acre), wet areas where groundwater seeps to the surface and forms temporary pools of standing water. Most of these features are not visible during summer droughts.

Project Area Water Quality and Beneficial Uses

No water quality data were located for streams in the project area; therefore, water quality condi-tions are based on observation and inference. Over the last century, disturbance of hillslopes in the area, particularly upstream on private lands, appears to have increased sediment levels in the main channels and tributaries of the project area. However, these streams likely carried moderate to high levels of fine sediments naturally in response to the deep, fine textured soils in the area. Chronic contributions of fine sediments from road surfaces may be occurring. Without further investigation, it is not possible to say if road surface fines are a significant or insignificant feature.

Stream temperatures have not been measured. However, current streamside vegetation on BLM lands in this area is generally adequate to shade surface waters during summer base flow, and stream temperature trends are probably toward general cooling as riparian vegetation matures. Since large numbers of cutthroat trout were observed throughout perennial streams in the project area, it is reasonable to conclude that water quality conditions are currently adequate for the maintenance of a healthy aquatic system.

Oregon Department of Environmental Quality's (DEQ) *1998 303(d) List of Water Quality Lim-ited Streams* is a compilation of streams which do not meet the state's water quality standards. Duffy and Greasy creeks are not listed in the report. However, Marys River (which both streams are tributary to) is listed as not meeting water quality standards for summer temperatures (too high), summer stream flows (too low), and fecal coliform levels (too high) from the mouth to its confluence with Greasy Creek.

The DEQ has published an assessment dealing with non-point water pollution in Oregon streams titled *1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution.* The publica-tion lists the Marys River, from its mouth to Greasy Creek, as having severe water quality prob-lems. This assessment was based on supporting data. Greasy Creek was also identified as hav-ing "moderate" water quality problems; however, this was based on observation, and there are no supporting data or additional information at this time.

Beneficial uses of surface water from the project area are displayed in Table D below. There are no known municipal or domestic water users in the project area. However, over six miles down-stream from the Greasy Creek headwaters, surface water from the Marys River is withdrawn and treated to supply the town of Philomath. Irrigation and livestock watering occur in the Greasy Creek and Duffy Creek valleys downstream from the project area. Additional beneficial uses of the stream-flow in the project area include both resident and anadromous fish, recreation, and esthetic values.

TABLE D: BENEFICIAL USES ASSOCIATED WITH STREAMFLOW IN THE PROJECT AREA

Stream (Watershed)	Project Action	Beneficial Use	Distance from Project Action	Information Source
Duffy Creek (Muddy Creek)	Stand density management Road construction and closure	Anadromous fish	> 10 miles	BLM
		Resident fish	Immediate	BLM
		Domestic use	> 4 miles	WRIS*
		Irrigation/live-stock watering	1 mile	WRIS*
Greasy Creek (Mary's River)	Stand density management Road construction and closure	Anadromous fish	> 10 miles	BLM
		Resident fish	Immediate	BLM
		Municipal water (City of Philomath)	6 miles	WRIS*
		Domestic use	1 mile	WRIS*
		Irrigation/live-stock watering	1 mile	WRIS*

* WRIS = Oregon Department of Water Rights Information System

Fish: Affected Environment

Duffy Creek, Section 17

Duffy Creek provides habitat for resident cutthroat trout (*Oncorhynchus clarki*), which are pres-ent in units 1 and 2. No fish are present in unit 3. These three units are all located in section 17. The mainstem of Duffy Creek is north of Unit 1 and has two tributaries that run through the unit. The first-

order tributary in the northwest corner of Unit 1 has fish present only up to the culvert at road 13-6-15. The other tributary that runs through the eastern side of Unit 1 is a third-order stream which contains resident cutthroat trout. Duffy Creek and its related tributaries consists of typical pool riffle habitat, with a substrate of gravels, smaller cobbles and sands.

The southeast section of Unit 3 has a small, first-order tributary to Beaver Creek, which is a non-fish bearing stream.

Greasy Creek, Section 7

Greasy Creek provides habitat for resident cutthroat trout (*Oncorhynchus clarki*), which are pres-ent in units 4, 5 and 6. None of the first-order streams have fish present. Fish are present only in the mainstem Greasy Creek (west of Unit 4) and the tributary west of Unit 5 and east of Unit 4. Dominant habitat type in the mainstem Greasy Creek is pool, step pool, and lateral scour pools. The dominant substrate is gravel and cobble.

Riparian: Affected Environment

Riparian Reserve Widths

Riparian Reserves in the proposed project would be 420 feet on each side of perennial, fish-bear-ing streams and 210 feet on each side of intermittent and perennial, non-fish bearing streams. These widths are in conformance with the RMP (p. 10). Within these Riparian Reserves, stands would be thinned to densities ranging from 59 to 119 trees per acre. The actual riparian zones along streams would be excluded from treatment, and only the upslope portions of the Riparian Reserves would be proposed for density management. (See Appendix A-3, Criteria for Identi-fying "No Cut Stream Buffers.")

Structure/Species Composition

The stands in units 1, 2 and 3 are relatively young (under 50 years), and all are uniform, densely stocked Douglas-fir stands. All still have relatively high crown ratios (30 to 50 percent). Units 1 and 3 have canopy closures over 85 percent, with little understory development. Crown clo-sure in Unit 2 is a little lower with understory conifers occurring in a few spots. Units 2 and 3 have few hardwoods, mostly occurring along streams. Hardwoods in Unit 1 occupy approxi-mately 10 percent of the stand. All three units have western hemlock and western red cedar occurring as a minor component in the stands. Many small snags occur in units 2 and 3 (all under 9" DBH), while Unit 1 has few snags, but they are larger (over 12" DBH). All three units have adequate CWD, but little or none is in decay classes 1 or 2.

The stand in units 4 and 6, although 10 to 15 years older than units 1, 2 and 3, has relatively small trees, with lower crown ratios. Seven per cent of the stand is hardwoods, but they occur mostly in clumps

outside the sale area. There is a small number of larger diameter western hem-lock and western red cedar. The canopy closure averages less than 70 percent, but this is due mostly to a few *Phellinus* openings which are primarily occupied by vine maple and hardwoods. The units have adequate CWD, but little or none is in decay classes 1 or 2. Few snags occur in these units.

The stand in unit 5 is a two story stand with approximately 18 large remnant Douglas-fir trees (over 30" DBH) per acre. The understory Douglas-fir stand is older and larger than the other 5 units but the stocking is similarly uniform and dense, with low crown ratios. Canopy closure is 80 percent and there is little conifer seedling development. There are a small number of larger western hemlock and western red cedar, but few hardwoods. The unit has adequate CWD, but little or none is in decay classes 1 or 2. There are many small snags (7"), but no large snags.

See the silvicultural prescription in the EA file and Appendix B-4 (Riparian Reserve Treatment Comparison) for specific stand data.

Disease

Phellinus was observed in most of the stands where it has created scattered openings less than 1/4 acre. Swiss needle cast was not observed in the area. It has been a continuing serious prob-lem near the coast but in recent years has been observed further inland. There is no consensus yet on how to manage stands infected or at risk for the disease, but it is agreed that selecting for other species where possible is a wise strategy.

Coarse Woody Debris (CWD)/Snags

The *Benton Foothills Watershed Analysis* (BFWA; 1997) recommends, for density management projects in Riparian Reserves, that two snags in the largest diameter classes be left per acre. It also recommends leaving the minimum levels of CWD recommended by the *Late-Successional Reserve Assessment, Oregon Coast Province-Southern Portion* (LSRA; 1997), plus three to five hard logs over 12" per acre. As Table E indicates, although the project areas meet LSRA cubic foot CWD requirements, they are lacking in down wood in decay classes 1 and 2. Snags in the proposed project are generally too small to meet BFWA snag recommendations.

TABLE E. SNAGS AND DOWN WOOD OCCURRING IN PROPOSED PROJECT AREA

Unit	CWD (cu. ft/ acre)[1]	CWD Decay Class 1-2 (pieces/acre >8')	CWD Decay Class 3-5 (pieces/acre >8')	Snags (#/acre)	Snags Size Range
1	2,944	0	14.3	5	19.0
2	3,080	3	41.7	70	5.8-9.0
3	2,515	0	14.3	75	6.2
4/6	7,548	1.7	38.3	17	8.0
5	4,398	0	17.1	16	7.0

[1] Using strategy #3 described in the LSRA, required short-term CWD minimums from Table 12 (p. 61) range between 525 and 2,844 cubic feet.

Water: Environmental Consequences

Alternative A, Proposed Action

Direct and Indirect Effects

Measurable effects to stream flow, channel conditions, and water quality due to the proposed action are unlikely. In the short-term, this action is unlikely to alter the current condition of the aquatic system either by affecting its physical integrity, water quality, sediment regime, or in-stream flows. Some short-term, variable increases in stream turbidity may result (discussed be-low). Alterations in the capture, infiltration and routing (both surface and subsurface) of precipi-tation may occur as a consequence of the mechanical removal of trees and reductions in stand density. This effect would be difficult to measure and unlikely to substantially alter stream flow or water quality. Any changes in the capture and routing of precipitation would likely return to pre-treatment conditions as the remaining forest fills out. Increases in mass wasting and altera-tions in sediment regime as a result of this action are of low probability.

For the protection of stream channels and aquatic resources, buffers or "no entry, no thin zones" were applied to all stream channels in the project area. These zones were determined in the field by BLM specialists following a protocol developed by the Marys Peak Resource Area hydrolo-gist, biologists and riparian ecologist. The protocol required a minimum twenty-five foot "no entry, no thin" zone. This zone could be extended upslope, during field surveys, as far as deemed necessary to protect aquatic resources. This determination was based on site features such as flood plains, slope breaks, slope

stability, water tables, etc.. Additionally, no treatments in riparian areas are proposed unless stand densities and composition clearly indicate the need. Hence, large areas of riparian vegetation were excluded from treatment under this proposal (e.g., the riparian zone along the main channel of Duffy Creek).

Since most of the stream channels in the project area do not flow in the summer, increases in stream temperature as a result of this action are unlikely. Shading along both Greasy and Duffy creeks is currently adequate in the project area and this proposal would not substantially alter streamside shading here.

Approximately 82 percent (14,200 feet) of the roads being proposed for construction, renovation or improvement would not result in additional compacted areas or increased surface runoff or sedimentation. The remainder of the roadwork, new construction, amounts to 18 percent or 3,200 feet. The 3,200 feet of new road construction is limited to locations on or very near the ridge line, which would eliminate interception/disruption of subsurface water flow. Road con-struction effects would be limited by restricting work to periods of low rainfall and runoff. Construction would employ techniques to reduce concentration of runoff and sedimentation to a minimum, and since no additional stream crossings would be constructed, there would be little opportunity for sediment from these surfaces to enter streams.

The main haul routes would be along the Beaver Creek road and Botkin Road. In both cases, hauling would occur on rocked surfaces for less than two miles before reaching paved surfaces. Timber hauling during periods when water is flowing on roads and into ditches could potentially increase stream turbidity if flows from ditches are large enough to enter streams.

Yarding corridors, if sufficiently compacted, may route surface water and sediment into streams; riparian reserves function as areas for sediment to settle out before reaching streams. During yarding, residual slash on the compacted areas would contribute to reducing the accumulation of runoff by deflecting and redistributing overland flow laterally to areas where it may infiltrate the soil. During periods of high rainfall, runoff from these surfaces should be observed to determine if it is significantly impacting stream turbidity. If a problem develops, corrective measures would be implemented during contract administration.

Tree removal would not occur on steep, unstable slopes where the potential for mass wasting adjacent to stream reaches is high. Therefore, increases in sediment delivery to streams due to mass wasting are unlikely to result from this action.

This proposal is unlikely to impede and/or prevent attainment of the stream flow and basin hydrology, channel function, or water quality objectives of the Aquatic Conservation Strategy (ACS; see Appendix B-2). Over the long-term this proposal should aid in meeting ACS objec-tives by speeding the development of older forest characteristics in the riparian zone.

Cumulative Effects

A "Level 1" analysis of the risk for cumulative effects to hydrologic processes as a result of this project was conducted utilizing the *Salem District Watershed Cumulative Effects Analysis Pro-cedure, FY1994*. The following conditions were observed:

1) Soils and most stream channels in the area are stable and functioning close to reference conditions.
2) Transient snow zone (TSZ) makes up less than 3 percent of the watershed, and no TSZ would be affected under this proposal.
3) 17 percent of upper Greasy Creek and 4 percent of Duffy Creek have been recently harvested.
4) This proposal is for thinning, not a full harvest, of forest stands.
5) The proposal includes minimal road construction on gentle slopes. This project would increase road length by 0.36 mile (0.3 percent of current levels) in the Beaver Creek watershed, increasing road density from 5.24 mile/sq. mi. to 5.25. In upper Greasy Creek, this proposal would increase road length by 0.25 mile in the watershed (1.5 percent of current levels) and increase road density from 8.5 mile/sq. mi. to 8.65.

Considering these factors, the risk of this proposal for contributing to cumulative effects to hy-drologic processes or water quality in these watersheds is low. To the extent that this proposal will influence overall watershed condition, it potentially could result in short-term, local in-creases in stream turbidity over haul routes (e.g., will only occur during and immediately after hauling and will not be visible or measurable downstream from the project area) and long-term increases in LWD recruitment potential to streams. Since LWD and pool habitat are "at risk" in these streams (see *Benton Foothills Watershed Analysis* [1997]) long-term LWD supply to streams is likely the most critical factor for maintenance of aquatic habitat in these watersheds. This proposal is expected to maintain or improve aquatic habitat in these watersheds over the long-term.

Alternative B

Direct and Indirect Effects

This alternative differs from the proposed alternative in that it would utilize cable logging tech-niques over a portion of the treatment area. Although there would be reduced levels of disturb-ance to hillslopes, logging costs would be increased and additional road construction would be required (1,200 feet of new, ridgeline road).

New road construction under this alternative would involve relatively small additional risks and disturbance since construction would be on stable ground which requires little excavation or fill. Road

surfaces would be minimized, and following treatment, approximately 400 feet of the road that is not required for future stand treatment would be ripped and blocked. No additional road stream crossings would occur under this proposal.

Cable yarding under this alternative would result in reduced levels of soil disturbance, primarily along yarding corridors, relative to ground-based yarding. Ground-based yarding methods inevi-tably present some level of increased risk, however small, for soil compaction and reductions in water quality relative to cable yarding. However, since the material being yarded is relatively small and light weight, disturbance from either method would be short-term and unlikely to result in measurable effects to water quality or aquatic resources.

Cumulative Effects

The scale of the additional disturbances under this alternative would be too small to be quantified in a watershed level cumulative effects analysis. There is no meaningful difference between this alternative and the preferred alternative relative to cumulative effects.

Alternative C

Direct and Indirect Effects

This alternative differs from the proposed alternative in that it would treat an additional seven acres in the northwest corner of section 17. Additional disturbance of hillslopes would result along with an additional 900 feet of road construction (900 feet of construction and one road crossing a stream).

Road construction under this alternative would involve relatively small additional risks and dis-turbance since construction would be on stable ground which requires little excavation or fill. This road surface is currently being utilized as a motorcycle trail, and the stream crossing, al-though stable, is currently unprotected (i.e., motorcycles cross the streambed and banks). Uti-lizing the risk rating system developed in the *Benton Foothills Watershed Analysis* (1997, p. 140), this stream crossing has a risk level of 3 (good channel stability with moderate beneficial use levels in the watershed) on a scale of 1-12, 12 being extremely high. Road surfaces would be minimized and following treatment, the road would be ripped and blocked. No additional road stream crossings would occur under this proposal.

Inevitably, increased levels of soil disturbance under this alternative present some level of in-creased risk for soil compaction and reductions in water quality, however small, relative to alter-natives A and B. However, since the material being yarded is relatively small and light weight, disturbance would be short-term and unlikely to result in measurable effects to water quality or aquatic resources. Since currently the greatest direct inputs of sediment to the stream are likely a result of motorcycles crossing the stream, this proposal would ultimately reduce sediment levels by blocking this crossing.

Cumulative Effects

The scale of the additional disturbances under this alternative would be too small to be quantified in a watershed level cumulative effects analysis. There is no meaningful difference between this alternative and the preferred alternative relative to cumulative effects.

Alternative D (No Action)

No action would result in the continuation of current conditions and trends at this site.

Fish/Environmental Consequences

Alternative A (Proposed Action)

The proposed action would have no measurable adverse impacts to local fish and fish habitat. Habitat and channel conditions are expected to be maintained. Impacts may occur due to small inputs of sediment, but would be short-term (a year or less). Sediment would be kept to a mini-mal level because of a) skyline yarding in sloped areas (for lift), b) the small amount (thinning) and size of timber being hauled out in conjunction with stream protection areas, and c) seasonal restrictions (see design features). Thinning within the riparian area will enhance stand condi-tions, growing trees faster than if the stand were to grow naturally. This will increase the poten-tial for high quality large woody debris.

Alternative B

The effects of this alternative would be similar to Alternative A, but it would involve less ground compaction and disturbance because there would be a) increased skyline yarding and b) one end suspension in Unit 1. This would decrease the likelihood and amount of sediment to local streams. Road construction (in Riparian Reserves) would increase sedimentation, but on the other hand, there would be less impact from sedimentation than if Unit 1 were to be ground-based yarded.

Alternative C

The effects of this alternative would be the same as Alternative A, but there would be an addi-tional adverse impact to the first-order stream in Unit 1 due to construction of a spur road over the stream and the “new” unit being ground-based and skyline yarded.

Alternative D

No action would not affect fish or fish habitat. Riparian stands would not be affected and would continue to grow naturally.

Riparian: Environmental Consequences

Alternative A

The prescription for the uplands portion of the stands also would be appropriate for the Riparian Reserves since it would also accomplish the goals identified for the Riparian Reserves. The goals of growing large trees more quickly and maintaining crown ratios can be achieved with a generally evenly spaced thinning. Some variable spacing would be accomplished by marking extra trees to cut in areas with a developing understory, or near trees with "wolfy" characteristics. In addition, extra leave trees would be marked next to existing snags, creating small clumps of trees. Later when the uplands are regeneration harvested, emphases in the Riparian Reserves would be to release the conifer understory, create large diameter CWD and snags, and enhance variable spacing.

Development of desired stand characteristics would be accelerated in the following ways:

Restored structural complexity of the stands: The proposed action would increase the amount of light penetrating the canopy. Increased light levels would promote growth and development of vegetation found at mid-canopy and ground levels. It is expected that understory initiation of shade tolerant conifers associated with canopy layering would be promoted in areas of increased light over the long-term. In the short-term, a more com-plex understory would develop, consisting of more shrub species.

Accelerated development of desired tree characteristics: Residual trees would increase in diameter and crown depth/width. Limb diameter on large limby trees would be main-tained by releasing those trees to an open grown condition. The long-term results of density management would be larger average DBH, and larger crowns (higher crown ratios) at any given age, compared to the no treatment option. As the table in Appendix B-4 indicates, diameters 40 years in the future in the treated stands would range from 10 percent to 25 percent larger, and crown ratios would range from 9 percent to 33 percent higher.

Accelerated development of desired snag and CWD characteristics: Desirable snag and CWD characteristics would be enhanced in two ways:

1. As the table in Appendix B-4 shows, residual trees would reach an average 20" DBH 20 to 40 years sooner compared to the no treatment alternative and therefore would meet the desired large diameter characteristics for snags and CWD more quickly. Snags and CWD could then be created from these larger trees. Addition-ally, trees smaller than stand average and at a consequently higher risk of mortal-ity, would reach an average 20" DBH more quickly compared to the no treatment option, creating natural opportunities for larger snag and CWD formation. Aver-age snag and CWD DBHs in Appendix B-4 range from 14 percent to 52 percent larger than in the no

treatment alternative.

2. CWD and snag enhancement would be achieved using strategy # 3 as described in the *Late Successional Reserve Assessment, Oregon Coast Province - Southern Portion, June 1997* (LSRA, p. 68). This strategy creates some short-term CWD and snags but reserves most as green trees to maximize long-term quantities and sizes of CWD and snags. Post-harvest monitoring would be accomplished to evaluate the size and condition of snags and CWD. It is expected that the harvest operation would create some CWD and possibly knock down some snags. Crea-tion of CWD during harvest could come from harvest activities, post-harvest windthrow, and beetle kill. This post-harvest monitoring would be done three years after it has been determined that the natural creation of CWD and snags as a by-product of harvest has essentially been completed. After monitoring, one tree per acre would be cut and left where needed to supply hard CWD. Snags would be created where needed to meet recommendations in the *Benton Foothills Water-shed Analysis* (1997). Following CWD scenario # 3 in the *LSRA*, most CWD and snags would be left as green trees until the mean stand diameter approximates 20". At that time, most likely when the upland portion of the project area is regeneration harvested, additional CWD and snags would be created.

Opening up the canopy may cause such ground level microclimatic changes as increased light levels, increased temperatures, lower humidity and increased wind speed. These effects would vary depending on aspect, slope, vegetation removed, and distance from a stream in any given area and therefore would be difficult to quantify. It is expected that they would be of short duration and would be ameliorated as crowns close and brush covers the ground.

There would be a short-term elevated risk of Douglas-fir bark beetle infestation in healthy stand-ing trees due to unyarded cut trees, windthrow, and logging damage to residual trees. Bark beetle infestation risk may be minimized by following guidelines developed for the Siuslaw National Forest. A summary of those guidelines is attached (Appendix B-5).

Alternatives B and C

Environmental consequences do not differ except in road building and yarding systems. These are covered in the Soils and Hydrology reports.

Alternative D

Impacts or lack thereof on the riparian zone would be as follows:

There would be no disturbance and consequently no microclimate changes in the Riparian

Reserves.

There would be no elevated risk of bark beetle infestation.

Stand mortality due to competition would increase, creating increased amounts of small CWD and snags.

Trees would continue at their present rate of growth, slowing as the canopy closes and competition for light becomes more intense.

Crown ratios would decrease at a faster rate compared to Alternatives A, B, or C.

The canopy would remain closed, allowing little light to penetrate to the ground, resulting in initiation of neither a conifer understory nor additional ground cover.

Natural disturbance would be the agent for creating stand structural diversity. This diver-sity would take considerably longer to develop than if the proposed treatment were imple-mented.

Appendix B-2 describes how the proposal would comply with the Aquatic Conservation Strategy Objectives.

G. Wildlife

Issue: Effects on special status, special attention and other wildlife species and their habitats.

Wildlife: Affected Environment

Refer to the attached Biological Evaluation Impacts Analysis (Appendix B-1) for a complete list of Special Status Species in the Marys Peak Resource Area and how this action impacts them.

The Duffy Creek Thinning is located along the western edge of the Benton Foothills Watershed. It is also within the matrix (General Forest Management Area; GFMA) land use allocation. The sale contains six units totaling 248 acres. All of the units are dominated by Douglas-fir and are in the mid-seral habitat type (age-classes range from 40 to 65 years). Unit 5 has some late-seral (80-199 years) trees (18 per acre) in the overstory, and there are a few scattered, remnant old-growth trees adjacent to some units. Mid-seral tree densities range from a low of 162 trees per acre in Unit 5 to a high of 325 in Units 4 and 6. The thinning prescription for the proposed alter-native would remove the smaller subdominant and codominant Douglas-fir and leave the larger dominant and codominant conifers. Post-treatment densities would range from 59 to 120 trees per acres. Since the largest trees with the best crown ratios would be left, the post-treatment crown canopy is expected to be 50 percent or greater over most of the action area.

All units were surveyed to protocol for Survey and Manage mollusks according to survey protocols established on August 31, 1998. As a result of these surveys, there are five known mollusk sites located in the following units:

Unit 1: 1 Blue-grey Tail-dropper
Unit 2: 1 Blue-grey Tail-dropper
Unit 3: 2 Papillose Tail-droppers
Unit 4: 1 Papillose Tail-dropper

All units will be surveyed for red tree vole (*P. longicaudus*) nests during the winter/spring of 2000. If stick nests are found, the trees will be climbed to determine if the nests are active tree vole nests.

There are some late-seral trees in Unit 5 and old-growth remnants adjacent to some units which may provide suitable nesting platforms for marbled murrelets. A patch of ten remnants occurs in a riparian zone just east of Unit 2, and there are some scattered remnants adjacent to units 4, 5, and 6. These areas will be surveyed to protocol during the 1999 and 2000 breeding seasons. The closest known occupied marbled murrelet site is over six miles to the west of these units.

There is an active northern spotted owl site in the extreme northwest corner of Section 7, less than 0.25 mile from Unit 6. The mid-seral habitat in units 4, 5, and 6 provide foraging, roosting, and dispersal habitat for the owl within its home range.

Wildlife: Environmental Consequences

Alternative A (Proposed Action)

Direct and Indirect Impacts

(Note: Direct and indirect impacts are defined as those which occur at the same time and place, or later in time or off-site.)

All five Survey and Manage slug sites would be protected with a 100 foot radius no entry, no thin buffer. The buffer and post-thinning canopy cover (overall, greater than 50 percent) would maintain suitable habitat conditions for the mollusks.

If active red tree vole nests are found during the year 2000 surveys, the nest(s) will be protected by no entry, no thin buffers according to the most current management recommendations.

Marbled murrelet surveys will be completed to protocol during the 1999 and 2000 breeding sea-sons. Murrelets are not expected to be using the site due to the marginal nature of the potential nesting

habitat. This potential nesting habitat is considered to be very marginal due to its distance from the coast, its distance to any known occupied sites, past disturbance history, small size, and its unprotected stature above the mid-seral understory. If murrelets are found to be occupying the site, then any nest trees will be buffered adequately to protect the nest site qualities, and daily noise restrictions will be imposed during the breeding season.

Thinning within the home range of the owl pair adjacent to units 4, 5, and 6 may affect the forag-ing and reproductive success of the pair. If thinning of Unit 6 occurs during the breeding season, noise disturbance may also affect breeding success

Cumulative Impacts

(Note: Cumulative impacts are defined as effects on the environment which result from the com-bined impact of the action when added to other past, present and future actions, regardless of who is responsible for such other actions.)

Both Sections 7 and 17 are surrounded by private lands which are managed for timber produc-tion. These private forests are cut during the mid-seral stage of forest/habitat development. The existing BLM lands are within the matrix (GFMA) and will be harvested during the late-seral stage. This area will never provide any significant interior late-seral or old-growth forest habitat under the current forest management regime. Populations of tail-droppers, voles, spotted owls, and murrelets may survive, but, based on current knowledge, would not be expected to thrive.

Alternatives B & C

Impacts to affected wildlife would be similar to Alternative A above.

Alternative D (No Action)

Under the no action alternative, the area will, over the next 20 to 40 years, develop into late-seral habitat. Populations of tail-droppers, voles, spotted owls, and marbled murrelets (if present) would persist and possibly become healthier.

H. Recreation and Special Forest Products

Issue: Effects on off-road vehicle and special forest products use.

Affected Environment and Environmental Consequences

There is a substantial amount of off-road vehicle use in Unit 1 and surrounding areas. Most of the use appears to be along old roads or skid roads and has caused soil damage in some areas. Under

alternatives A, B, and C, off-road vehicle use would be decreased. Under the no action alternative, off-road vehicle use would continue at current levels. No specific unique or sensitive recreation resources were identified in other units. The general project area most likely receives moderate recreation use, with activities consisting of undeveloped camping, hunting, target shooting, and off-highway vehicle (ORV) and horseback riding.

Special forest products in the proposal area include floral greenery, transplants, and fuelwood. There would be no anticipated impacts to removal of special forest products under either the proposed action or the alternatives.

IV. MONITORING

Monitoring would be accomplished through timber sale administration and in accordance with monitoring guidelines in the RMP, Appendix J**.**

Dependent on funding availability, Riparian Reserves would be monitored for:

A. A CWD/snag survey three years after harvest.

B. Conifer understory initiation to determine if release from brush competition is necessary.

C. In addition to implementation monitoring, the following effectiveness/validation mon-itoring would be helpful in evaluating future projects:

1. Crown closure: Permanent plots to determine crown closure immediately following harvest and in subsequent years. The results would indicate what crown closure can be expected from a similar thinning in a similar stand, and how quickly it could be expected to close after treatment.

2. Suitability for second density management treatment when the upland portions are considered for regeneration harvest.

V. CONSULTATION

In addition to the interdisciplinary team that developed and reviewed this proposed action, the following agencies or individuals were consulted:

U. S. Fish and Wildlife Service
Oregon Department of Fish and Wildlife
Oregon Water Resources Department
National Marine Fisheries Service
Frances Philipek, BLM, Archaeologist

Adjacent Landowners:

Private individuals (Ref. EA file)
Willamette Industries
Oregon Department of Forestry
Starker Forests

VI. LIST OF PREPARERS/INTERDISCIPLINARY TEAM MEMBERS

NAME	TITLE	RESOURCE ASSIGNED	INITIALS	DATE
Roy S. Majewski	Forester	IDT Lead, Logging Systems		
Russell Buswell	Engineer	Engineering		
Bill Caldwell	Forester	Silviculture		
Tom Tomczyk	Fuels Specialist/Soils Scientist	Fuels/Air/Soils		
Steve Liebhardt	Fish Biologist	Fisheries		
Amy Haynes	Riparian Ecologist	Riparian Reserves		
Gary Licata	Terrestrial Biologist	Wildlife		
Ron Exeter	Botanist	Botany, Noxious Weeds		
Belle Verbics	NEPA Coordinator	Coordination		
Patrick Hawe	Hydrologist	Hydrology		
Randy Gould	Natural Resources	Supervision		

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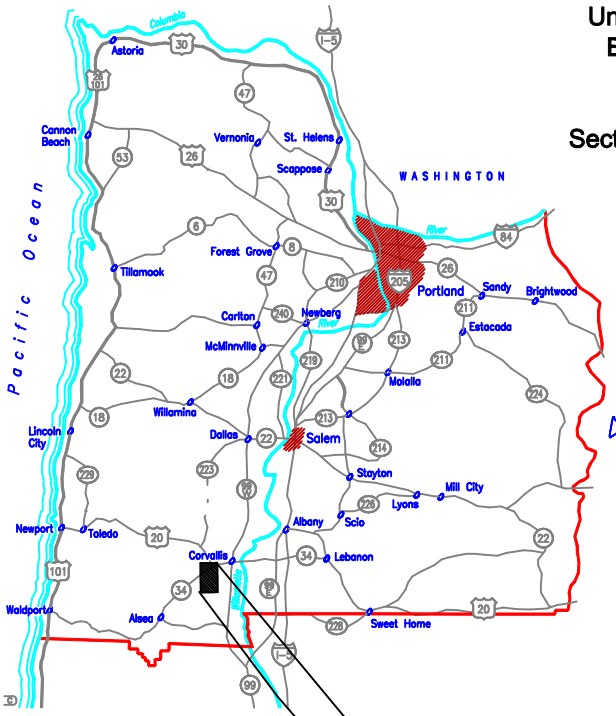
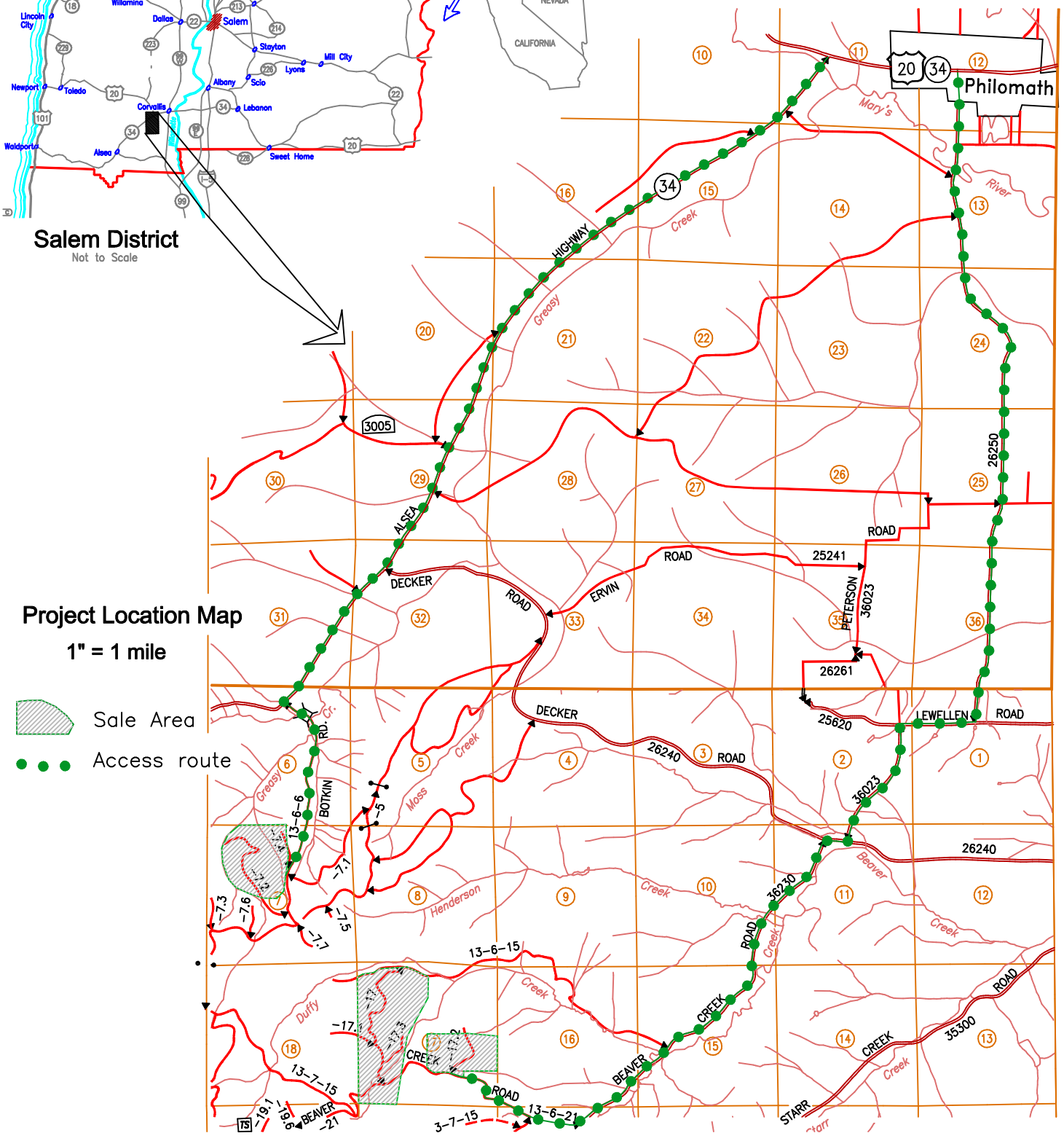
Duffy Creek Project Location Map
Sections 7 & 17, T.13 S., R. 6 W., Will. Mer.
Salem District - Oregon

EA No. OR080-1999-10

APPENDIX A

Vicinity Map





July 28, 1999

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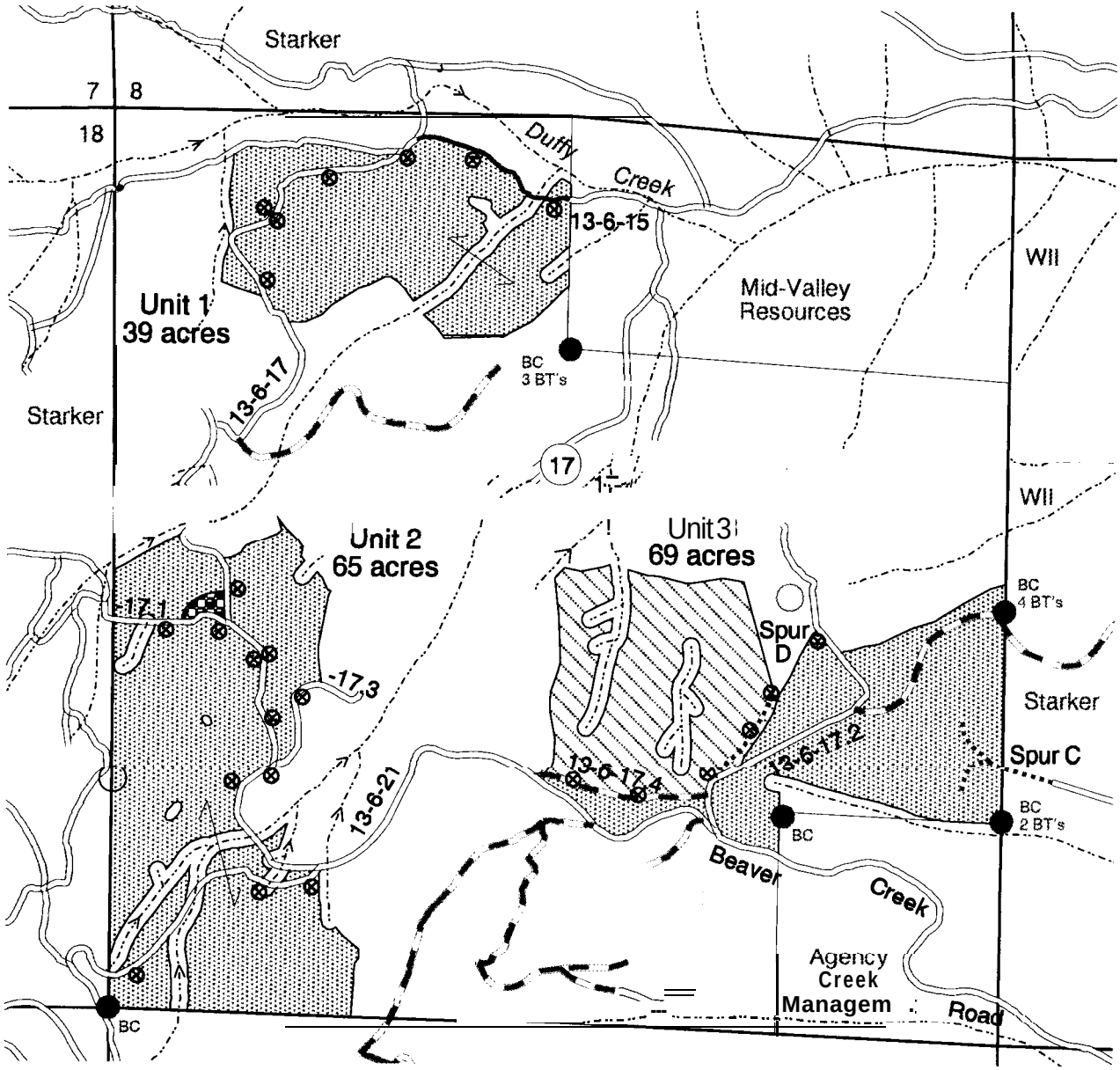
DUFFY CREEK PROJECT MAP - ALT. A

T. 13 S., R. 6 W. Section 17, W. M. ▪ SALEM DISTRICT ▪ OREGON



LEGEND

- Fungi Location
- Ground-based Yarding
- Skyline Yarding
- ⊗ Landings

Scale: 1" = 1,000'

- Existing Roads
- Jeep road
- New construction
- Road to be reconstructed
- Streams

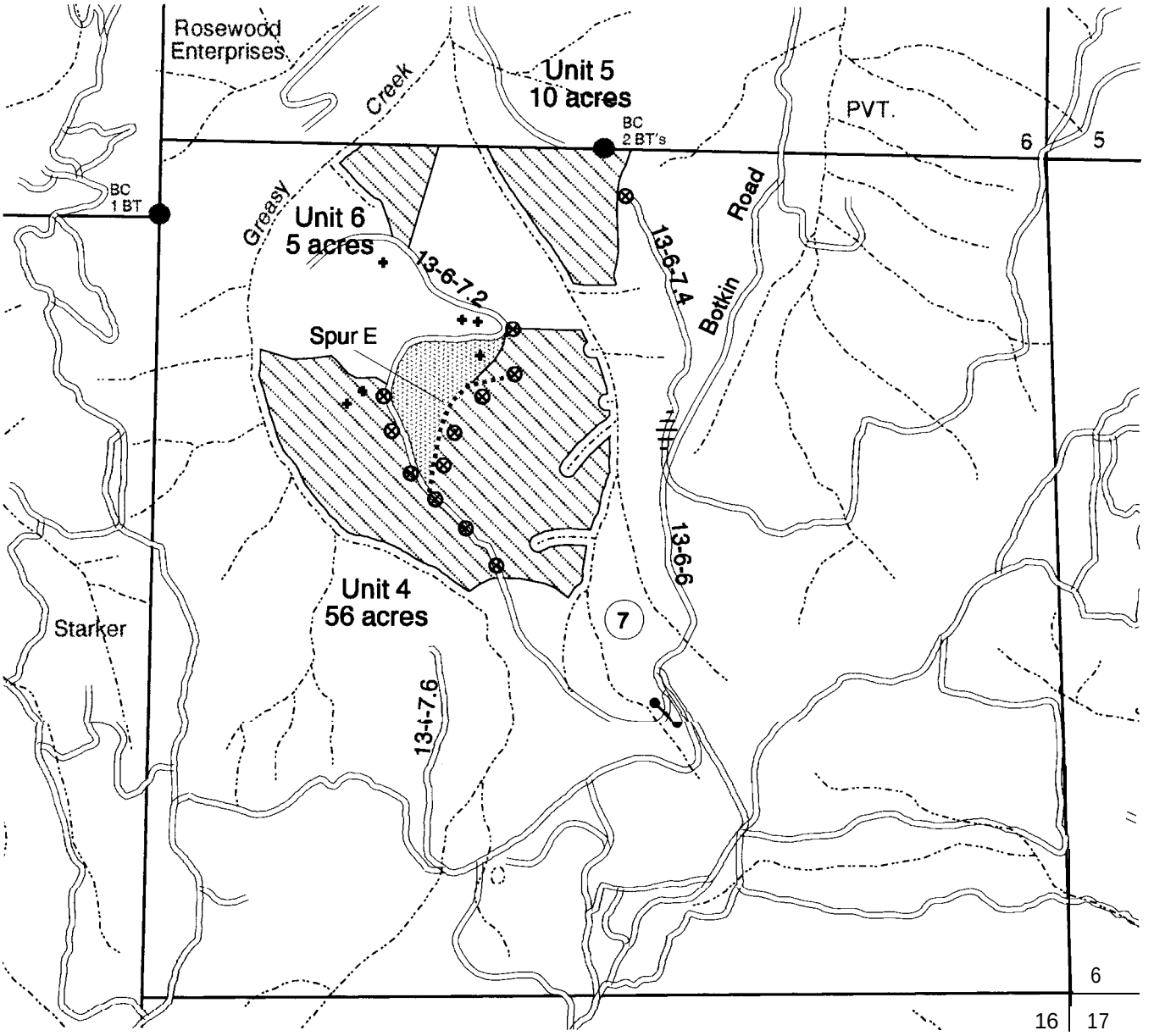
N
A

1999

United States Department of the Interior
BUREAU OF LAND MANAGEMENT

DUFFY CREEK PROJECT MAP - ALT. A

T. 13 S., R. 6 W. Section 7, W. M. ▪ SALEM DISTRICT ▪ OREGON



LEGEND

Scale: 1" = 1,000'

- Ground-based Yarding
- Skyline Yarding
- ⊗ Landings
- Gate to be Installed
- Barricade
- Existing Roads
- Jeep road
- New construction
- Road to be reconstructed
- Streams
- + Plus Tree Location (6)

N

July 28, 1999

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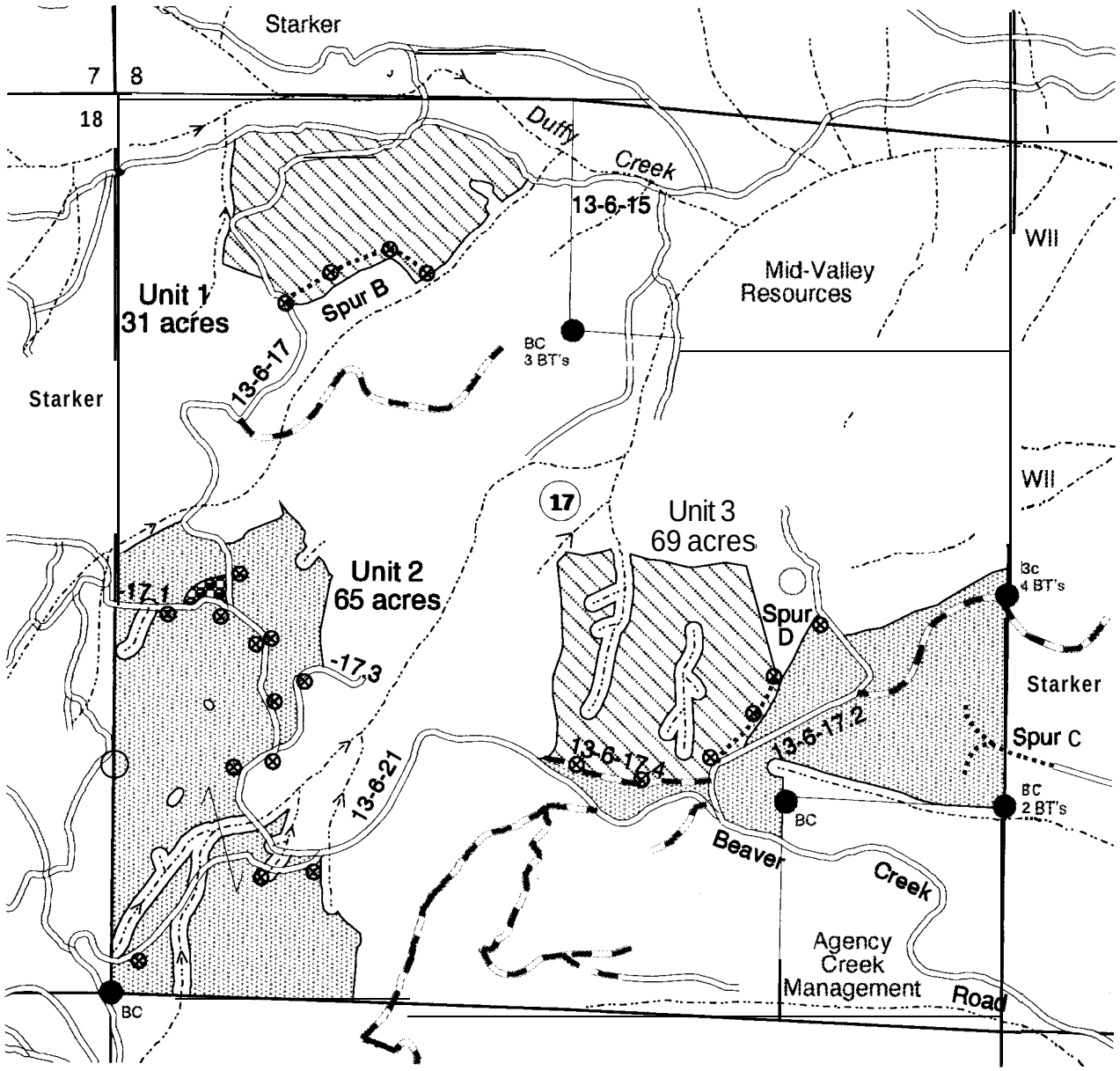
DUFFY CREEK PROJECT MAP - ALT. B

T. 13 S., R. 6 W. Section 17, W. M. - SALEM DISTRICT - OREGON



Scale: 1" = 1,000'

LEGEND

- Fungi Location
- Ground-based Yarding
- Skyline Yarding
- ⊗ Landings
- Existing Roads
- Jeep road
- New construction
- Streams

N

United States Department of the Interior
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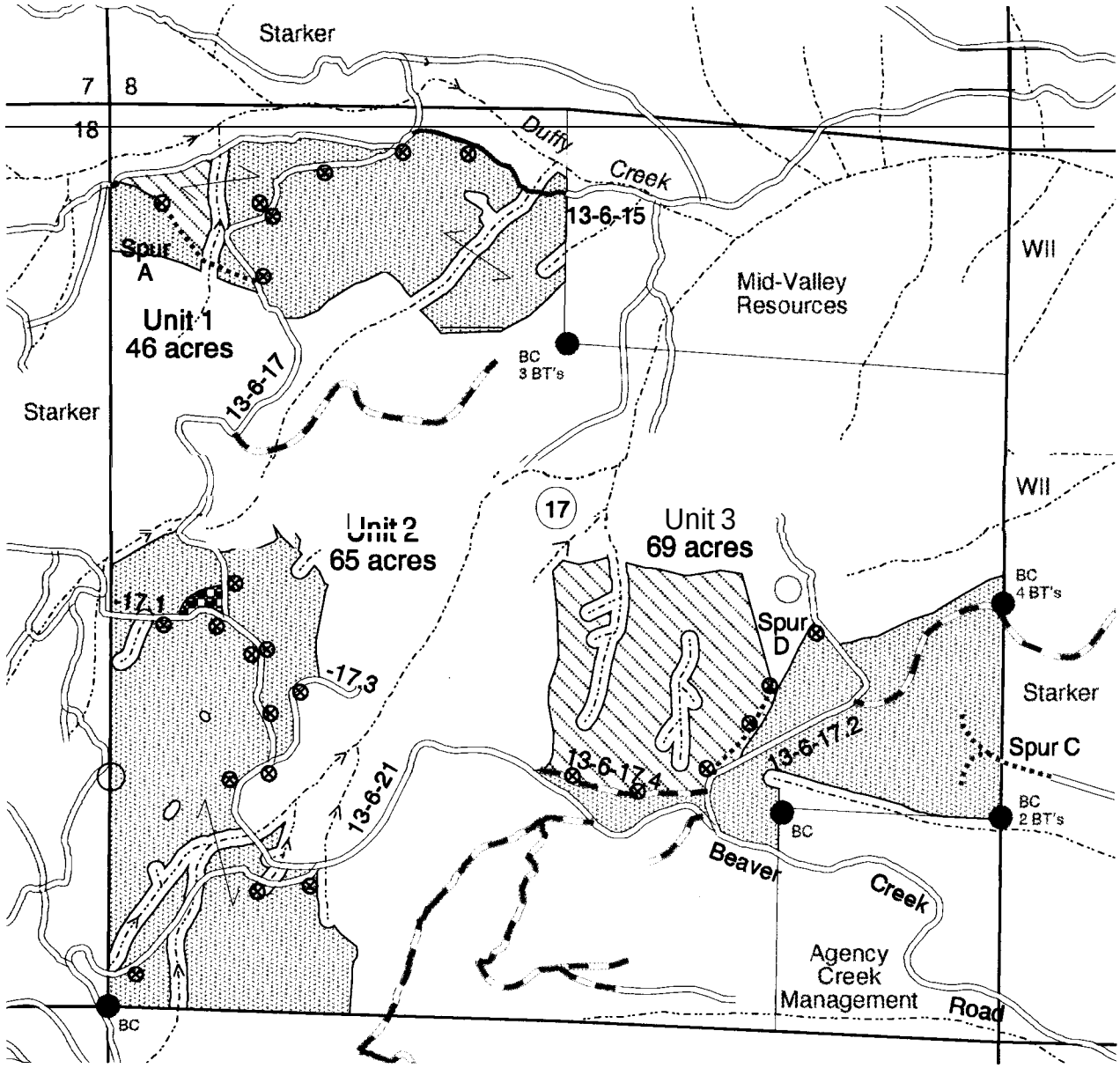
DUFFY CREEK PROJECT MAP - ALT. C

T. 13 S., R. 6 W. Section 17, W. M. • SALEM DISTRICT • OREGON



LEGEND

- FungiLocation
- Ground-based Yarding
- Skyline Yarding
- ⊗ Landings

Scale: 1" = 1,000'

- Existing Roads
- Jeep road
- New construction
- Road to be reconstructed
- Streams

N
A

Appendix A-2

TABLE A. DESIGN FEATURES: ALTERNATIVE A (PROPOSED ACTION)

Unit No.	Treatment	Acres	Vol/ Acre (MBF)	Volume (MBF)	Ground-based (acres)	Cable (partial suspen.)
1	Commercial Thinning	12	13	156	12	-
1-RR	Density Management	27	13	351	27	-
2	Commercial Thinning	30	10	300	30	-
2-RR	Density Management	40	10	400	40	-
3	Commercial Thinning	44	15	660	33	11
3-RR	Density Management	24	15	360	7	17
4	Commercial Thinning	26	17	442	7	19
4-RR	Density Management	30	17	510	0	30
5	Commercial Thinning	2	15	30	0	2
5-RR	Density Management	8	15	120	0	8
6	Commercial Thinning	1	17	17	0	1
6-RR	Density Management	4	17	68	0	4
Totals	Commercial Thinning	115		1,605	156	92
	Density Mangement	133		1,809	-	-

Appendix A-2 (cont.)

TABLE B. DESIGN FEATURES: ALTERNATIVE B

Unit No.	Treatment	Acres	Vol/Acre (MBF)	Volume (MBF)	Ground-based (acres)	Cable (partial suspen.)
1	Commercial Thinning	12	13	156	12	-
1-RR	Density Management	19	13	247	19	-
2	Commercial Thinning	30	10	300	30	-
2-RR	Density Management	40	10	400	40	-
3	Commercial Thinning	44	15	660	33	11
3-RR	Density Management	24	15	360	7	17
4	Commercial Thinning	26	17	442	7	19
4-RR	Density Management	30	17	510	0	30
5	Commercial Thinning	2	15	30	0	2
5-RR	Density Management	8	15	120	0	8
6	Commercial Thinning	1	17	17	0	1
6-RR	Density Management	4	17	68	0	4
Totals	Commercial Thinning	115		1,605	148	92
	Density Management	125		1,705	-	-

Appendix A-2 (cont.)

TABLE C. DESIGN FEATURES: ALTERNATIVE C

Unit No.	Treatment	Acres	Vol/Acre (MBF)	Volume (MBF)	Ground-based (acres)	Cable (partial suspen.)
1	Commercial Thinning	13	13	169	13	-
1-RR	Density Management	33	13	429	30	3
2	Commercial Thinning	30	10	300	30	-
2-RR	Density Management	40	10	400	40	-
3	Commercial Thinning	44	15	660	33	11
3-RR	Density Management	24	15	360	7	17
4	Commercial Thinning	26	17	442	7	19
4-RR	Density Management	30	17	510	0	30
5	Commercial Thinning	2	15	30	0	2
5-RR	Density Management	8	15	120	0	8
6	Commercial Thinning	1	17	17	0	1
6-RR	Density Management	4	17	68	0	4
Totals	Commercial Thinning	116		1,618	160	95
	Density Management	139		1,887	-	-

Appendix A-3

Criteria for Identifying "No Cut Stream Buffers"

1) A 25-foot minimum buffer will be flagged to exclude the following areas based on field identified features (whichever is greatest). Activities may occur in this area, but material will not be removed, and heavy machinery or equipment will not be allowed.

   a. Slope break: point below which the slope is actively eroding and contributing sediment to the stream.

   b. Flood plain: flat, accessed by the stream only infrequently.

   c. Stream banks: feature which contains the "active" stream channel.

   d. High water tables: flat, mushy soils, skunk cabbage, standing water, etc..

   e. Flood prone: two times the maximum depth at bank full (for streams with none of the above).

2) The "minimum" buffer width will be modified based on associated issues or field identified risks. Examples include the following:

   a. Perennial streams at risk for temperature increases due to the action (e.g., southern aspect, low topographic relief, vegetation provides significant shading).

   b. Unstable slopes: actively eroding sites adjacent to streams with ravel on the surface and "jack-strawed" trees would be excluded from thinning activities.

   c. "Sensitive" streams: sand bed channels or channels with high residual impacts (bank erosion, incision, heavy fine sediment load, etc.) may warrant extra protection.

Appendix A-4

TABLE A. DESIGN FEATURES - ROADS: ALTERNATIVE A

Road No.	New Road construction (feet)	Road Renovation (feet)	Road Improvement (feet)	Road Surfacing	Barricade or Gate
13-6-15	-	-	-	-	Barricade
13-6-17	-	6,000	-	Maintenance Rock	-
13-6-17.4	-	-	1,000	New Rock	Barricade
13-6-17.1	-	500	-	Maintenance Rock	-
13-6-17.2	-	1,400	-	Maintenance Rock	-
13-6-17.3	-	400	-	Maintenance Rock	-
13-6-Spur C	1,000	900	-	-	Barricade
13-6-Spur D	900	-	-	New Rock	Barricade
13-6-Spur E	1,300	-	-	New Rock	-
13-6-7.2	-	-	2,300	Maintenance Rock	Gate
13-6-7.4	-	1,700	-	-	Barricade
Totals	3,200	10,900	3,300	-	-

Appendix A-4 (cont.)

TABLE B. DESIGN FEATURES - ROADS: ALTERNATIVE B

Road No.	New Road construction (feet)	Road Renovation (feet)	Road Improvement (feet)	Road Surfacing	Barricade/ Gate/Rip
13-6-17	-	4000	-	Maintenance Rock	-
13-6-17.1	-	500	-	Maintenance Rock	-
13-6-17.2	-	1,400	-	Maintenance Rock	-
13-6-17.3	-	400	-	Maintenance Rock	-
13-6-Spur D	900	-	-	New Rock	Barricade
13-6-17.4	-	-	1,000	New Rock	Barricade
13-6-Spur B	1,200	-	-	New Rock	Barricade/ Rip ~400'
13-6-Spur C	1,000	900	-	-	Barricade
13-6-Spur E	1,300	-	-	New Rock	-
13-6-7.2	-	-	2,300	Maintenance Rock	Gate
13-6-7.4	-	1,700	-	-	Barricade
Totals	4,400	8,900	3,300	-	-

Appendix A-4 (cont.)

TABLE C. DESIGN FEATURES - ROADS: ALTERNATIVE C

Road No.	New Road construction (feet)	Road Renovation (feet)	Road Improvement (feet)	Road Surfacing	Barricade or Gate
13-6-15	-	-	-	-	Barricade
13-6-Spur A	900	-	-	New Rock	Barricade/ Rip
13-6-17	-	6,000	-	Maintenance Rock	-
13-6-17.4	-	-	1,000	New Rock	Barricade
13-6-17.1	-	500	-	Maintenance Rock	-
13-6-17.2	-	1,400	-	Maintenance Rock	-
13-6-17.3	-	400	-	Maintenance Rock	-
13-6-Spur C	1,000	900	-	-	Barricade
13-6-Spur D	900	-	-	New Rock	Barricade
13-6-Spur E	1,300	-	-	New Rock	-
13-6-7.2	-	-	2,300	Maintenance Rock	Gate
13-6-7.4	-	1,700	-	-	Barricade
Totals	4100	10,900	3,300	-	-

Appendix A-4 (cont.)

Table D. Design Features - Summary: All Alternatives

	New Construction	Road Renovation*	Road Improvement*
Alternative A	**3,200 Feet**	**10,900 Feet**	**3,300 Feet**
Alternative B	**4,400 Feet**	**8,900 Feet**	**3,300 Feet**
Alternative C	**4,100 Feet**	**10,900 Feet**	**3,300 Feet**

***** See Glossary, Appendix C-2, for definition.

APPENDIX B-1
BIOLOGICAL EVALUATION IMPACTS ANALYSIS
for MARYS PEAK R.A. SPECIAL STATUS WILDLIFE SPECIES

PROJECT: **DUFFY CREEK THINNING** (Matrix)

Species Common Name	NFP	ESA	OR	BLM	RMP	ONHP	Impact Issue / Comments	
Acorn Woodpecker	NL	NL	NL	BT	PS	3	NO / 1	Action area is not suitable nesting or foraging habitat for this species
All Amphibians in RR	RR	NL	NL	NL	SAS	NL	NO / 2	No-cut buffers and post-harvest leave trees will maintain enough canopy closure (>=50%) to protect stream and soil temperatures and humidities
All Bats in RR	RR	NL	NL	NL	NL	NL	NO / 3	Little impact to nesting, roosting, and foraging habitats; see 2 above
All Mollusks in RR	RR	NL	NL	NL	NL	NL	NO /	see 2 above
All Neotropical Migratory Birds	NL	NL	NL	NL	PS	NL	NO / 4	Post-harvest leave trees will provide ample nesting and foraging habitats
All Raptors	NL	NL	NL	NL	PS	NL	NO / 5	No known nest trees; if found, active nests will be buffered during breeding season
All Woodpeckers	NL	NL	NL	NL	PS	NL	NO / 6	All existing snags will be maintained, future snags will be available from leave trees
American Marten	RR	NL	SV	BA	SAS/SSS	3	NO / 7	Coarse structure, both vertical and horizontal, will be maintained in the units
Bald Eagle	NL	FT	ST	NL	SSS	1	NO / 8	No known sites within noise or visual restrictions
Band-Tailed Pigeon	NL	NL	NL	NL	PS	NL	NO /	see 4 above
Black Bear	NL	NL	NL	NL	PS	NL	NO / 9	Post-harvest conditions will continue to provide suitable breeding and foraging habitats
Black-Tailed Deer	NL	NL	NL	NL	PS	NL	NO /	see 9 above
Blue Grouse	NL	NL	NL	NL	PS	NL	NO /	see 9 above
Blue-Grey Tail-Dropper	RR/S&M	NL	NL	BA	SAS/SSS	2	YES/10	Surveys to protocol have identified two known sites
California Quail	NL	NL	NL	NL	PS	NL	NO /	see 9 above
Clouded Salamander	RR	NL	SU	BA	SAS/SSS	3	NO /	see 9 above
Douglas-fir Platylygus Bug	NL	NL	NL	BT	PS	3	NO /	see 9 above
Elk	NL	NL	NL	NL	PS	NL	NO /	see 9 above
Fisher	NL	NL	SC	BS	SSS	2	NO /	see 7 above
Foliaceous Lace Bug	NL	NL	NL	BA	SSS	3	NO /	see 1 above
Fringed Myotis	RR/BRS	NL	SV	BS	SAS/SSS	3	NO /	see 3 above
Great Blue Heron	NL	NL	NL	NL	PS	NL	NO /	see 1 above
Harlequin Duck	NL	NL	SU	BA	NL	2	NO /	see 1 above
Little Willow Flycatcher	NL	NL	SV	BT	PS	3	NO /	see 9 above

PROJECT: DUFFY CREEK THINNING (Matrix)

Species Common Name	NFP	ESA	OR	BLM	RMP	ONHP	Impact Issue / Comments
Long-Eared Myotis	RR/BRS	NL	SU	BT	SAS	4	NO / see 3 above
Long-Legged Myotis	RR/BRS	NL	SU	BT	SAS	3	NO / see 3 above
Malone Jumping Slug	RR/S&M	NL	NL	BS	SAS/SSS	1	NO/11 Surveyed to protocol; no known sites found
Marbled Murrelet	RR	FT	ST	NL	SAS/SSS	1	YES/12 Potential nest trees present; surveys to protocol will be completed in August of 2000
Marys Peak Ice Cricket	NL	NL	NL	BS	SSS	1	NO / see 1 above
Montane Bog Dragonfly	NL	NL	NL	BT	NL	4	NO / see 1 above
Mountain Lion	NL	NL	NL	NL	PS	NL	NO / see 9 above
Mountain Quail	NL	NL	NL	NL	PS	NL	NO / see 4 above
Mourning Dove	NL	NL	NL	NL	PS	NL	NO / see 4 above
Northern Goshawk	NL	NL	SC	BS	SSS	3	NO / see 5 above
Northern Pygmy Owl	NL	NL	NL	BT	PS	4	NO / see 5 above
Northern Saw-Whet Owl	NL	NL	NL	BA	SSS	NL	NO / see 5 above
Northern Spotted Owl	RR	FT	ST	NL	SAS/SSS	1	YES/13 Active known owl site w/i 0.25 of Unit 6; impacts to foraging habitat
Olive-Sided Flycatcher	NL	NL	SV	BT	PS	3	NO / see 4 above
Oregon Giant Earthworm	NL	NL	NL	BS	SSS	1	NO / see 9 above
Oregon Megomphix	RR/S&M	NL	NL	BS	SAS/SSS	1	NO / see 11 above
Papillose Tail-Dropper	RR/S&M	NL	NL	BA	SAS/SSS	2	YES/14 Surveys to protocol have identified three known sites
Peregrine Falcon	NL	FE	SE	NL	SSS	1	NO / see 5 above
Pileated Woodpecker	NL	NL	SV	BA	SSS	4	NO / see 6 above
Purple Martin	NL	NL	SC	BS	SSS	3	NO / see 6 above
Red Tree Vole	RR/S&M	NL	NL	NL	SAS	NL	YES/15 Surveys will be done during the winter of 2000; if nest trees found they will be protected
Red-Legged Frog	RR	NL	SU	BA	SAS/SSS	3	NO / see 2 above
Roth's Blind Ground Beetle	NL	NL	NL	BS	SSS	1	NO / see 1 above
Ruffed Grouse	NL	NL	NL	NL	PS	NL	NO / see 9 above
Sharp-Tailed Snake	NL	NL	SV	BA	SSS	4	NO / see 2 above
Siskiyou Chloealtis Grasshopper	NL	NL	NL	BA	SSS	3	NO / see 1 above
Silver-Haired Bat	RR/BRS	NL	SU	BT	SAS	3	NO / see 3 above

PROJECT: DUFFY CREEK THINNING (Matrix)

Species Common Name	NFP	ESA	OR	BLM	RMP	ONHP	Impact Issue / Comments
Southern Torrent Salamander	RR	NL	SV	BT	SAS	3	NO / see 2 above
Tailed Frog	RR	NL	SV	BA	SAS/SSS	3	NO / see 2 above
Taylor's Checkerspot Butterfly	NL	NL	NL	BS	SSS	1	NO / see 1 above
Townsend's Big-Eared Bat	RR/BRS	NL	SC	BS	SSS	2	NO / see 1 above; no known cave/cavelike structures
True Fir Pinalitus Bug	NL	NL	NL	BT	PS	3	NO / see 9 above
Valley Silverspot Butterfly	NL	NL	NL	BA	SSS	2	NO / see 1 above
Warty Jumping-Slug	RR/S&M	NL	NL	BA	SAS/SSS	2	NO / see 11 above
Western Bluebird	NL	NL	SV	BA	SSS	4	NO / see 4 above
Western Pond Turtle	NL	NL	SC	BS	SSS	2	NO / see 1 above
Western Rattlesnake	NL	NL	SV	BT	NL	4	NO / see 1 above
Western Toad	RR	NL	SV	BT	SAS	3	NO / see 9 above
White-Footed Vole	NL	NL	SU	BT	PS	3	NO / see 2 above
Wild Turkey	NL	NL	NL	NL	PS	NL	NO / see 9 above
Yuma Myotis	RR/BRS	NL	NL	BT	SAS	4	NO / see 3 above

NL = Not Listed at this time

NFP = Northwest Forest Plan: **RR**=Riparian Reserve Species; **S&M**=Survey & Manage Species; **BRS**=Bat Roost Site Species

ESA = Endangered Species Act: **FE**=Federal Endangered; **FT**=Federal Threatened; **FPE**=Federal Proposed Endangered; **FPT**=Federal Proposed Threatened; **FC**=Federal Candidate Species

OR = ODFW Listings: **SE**=State Endangered; **ST**=State Threatened; **SC**=State Critical; **SV**=State Vulnerable; **SP**=State Peripheral or Naturally Rare; **SU**=State Undetermined Status

BLM = OR/WA S.O. Listings: **BA**=Bureau Assessment; **BS**=Bureau Sensitive; **BT**=Bureau Tracking

RMP = Salem D.O. Listings: **SAS**=Special Attention Species; **SSS**=Special Status Species; **PS**=Priority Species

ONHP = Oregon Natural Heritage Program : **1**=Threatened with extinction; **2**=Threatened with extirpation; **3**=May be threatened; **4**=Require continued monitoring

Impact Issue = NEPA Process: **N**=No substantial impact(s) to the species or its habitat from the proposed project, no further evaluation in an EA is necessary; **Y**=impact(s) to species or its habitat occur and further evaluation is necessary in EA issues analysis

Signature:_____ Date:____/____/____

Appendix B-2

Aquatic Conservation Strategy Objectives Review Summary

(Note: See RMP, pp. 5-6, for more detailed explanations of the ACS objectives.)

ACS Objective	Does Project Meet this ACS Objective?	Remarks / References If "Yes," How? If "No," Why Not?
Maintain and restore distribution, diversity, and complexity of watershed and landscape features to ensure protection of aquatic systems.	Yes X No ___	Silvicultural treatment in managed stands less than 80 years of age offers the opportunity to reduce overstocked density, moderate tree species diversity, alter forest structural characteristics, and amend coarse woody debris conditions. Such treatments are believed to result in forest stands that more closely approximate the structure and function of a late-successional forest. As these treated stands age beyond 80 years, secondary structural characteristics (e.g., understory canopy development, large dominant trees) are likely to develop sooner than if no treatments were performed. The proposed density management project within the Riparian Reserves would be a means to enhance late-successional forest conditions and speed up attainment of these conditions across the landscape. Since Riparian Reserves provide travel corridors and resources for aquatic, riparian-dependant and other riparian and/or late-successional associated plants and animals, the increased structural and plant diversity would ensure protection of aquatic systems by maintaining and restoring the distribution, diversity and complexity of watershed and landscape features.
Maintain and restore spatial connectivity within and between watersheds.	Yes X No ___	Although logging would cause short-term disturbance in the Riparian Reserves, long-term connectivity of terrestrial watershed features would be improved by speeding the development of older forest characteristics. In time, these reserves would improve in functioning as refugia for late successional, aquatic and riparian associated and dependent species. The only new road construction in Riparian Reserves would be decommissioned after the harvest (Alternative B), or would improve a trail currently used by ORVs, and would likely result in decreased sediment delivery to the stream (Alternative C). No stream crossing culverts would be used that would potentially hinder movement of aquatic species; therefore, no barriers would be created. Both terrestrial and aquatic connectivity would be maintained, and over the long-term, as Riparian Reserves develop late successional characteristics, trans-riparian and intra-riparian connectivity would be restored.

ACS Objective	Does Project Meet this ACS Objective?	Remarks / References If "Yes," How? If "No," Why Not?
Maintain and restore physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.	Yes X No ___	A no cut stream protection buffer would maintain the integrity of shorelines, banks and bottom configurations. Criteria used to designate buffers were riparian vegetation, significant slope breaks, active flood plain or high water tables, and areas contributing to stream shading. All buffers are a minimum of 25 feet. Trees would be directionally felled within one tree height of the buffers, and any part that falls within the buffers would not be yarded out. Management activity throughout the project area is not likely to cause any alteration in water flows that could affect channel morphology.
Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.	Yes X No ___	Water quality necessary to support healthy riparian, aquatic, and wetland ecosystems would be maintained. Increases in stream temperature as a result of this action are unlikely. Stream protection buffers were designed to provide adequate shading. Sedimentation would be minimized by restricting road construction and ground-based yarding to periods of low rainfall and runoff. New road construction would employ techniques to reduce concentration of runoff and keep sedimentation to a minimum.
Maintain and restore the sediment regime under which the system evolved.	Yes X No ___	Increases in mass wasting and alterations in sediment regime as a result of this action are of low probability. Some short-term, variable increases in stream turbidity may result, but they would likely be within the range under which the system evolved. Sedimentation would be minimized by restricting road construction and ground-based yarding to periods of low rainfall and runoff. New road construction would employ techniques to reduce concentration of runoff and keep sedimentation to a minimum. Project design features would maintain the physical integrity of the hillslopes and channel; no alteration of the current sediment regime is expected.
Maintain and restore instream flows.	Yes X No ___	Instream flows would be maintained. Alterations in the capture, infiltration and routing (both surface and subsurface) of precipitation may occur as a consequence of the mechanical removal of trees and reductions in stand density. This effect would be difficult to measure and unlikely to substantially alter streamflow or water quality.

ACS Objective	Does Project Meet this ACS Objective?	Remarks / References If "Yes," How? If "No," Why Not?
Maintain and restore the timing, variability and duration of flood plain inundation and water table elevation in meadows and wetlands.	Yes X No ___	The proposed thinning would not alter existing patterns of flood plain inundation or water table elevation, because it would have no effects or only negligible effects on existing flow patterns and stream channel conditions.
Maintain and restore the species composition and structural diversity of plant communities in riparian zones and wetlands to provide thermal regulation, nutrient filtering, and appropriate rates of bank erosion, channel migration and CWD accumulations.	Yes X No ___	Riparian vegetation (stream protection buffers) along streams would be excluded from treatment, and only the upslope portions of the Riparian Reserves would be included in the density management treatment. All trees within one tree height of stream protection buffers would be directionally felled away from streams. If a cut tree does fall within a stream protection buffer, that part of the tree would remain unyarded. Stream buffers and residual trees would continue shading streams. Thinning in the Riparian Reserves would help restore structural diversity, complex understory components, and grow large trees more quickly than if stands were untreated.
Maintain and restore habitat to support well distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species	Yes X No ___	Habitat to support well distributed riparian-dependent and riparian associated species would be restored by reducing overstocked stands, moderating tree species diversity, altering forest structural characteristics, and amending coarse woody debris conditions. Such treatments are believed to result in forest stands that exhibit such older forest characteristics as large diameter trees with deep, wide crowns and large limbs, complex understorys with vegetation developing at mid-canopy and ground levels, and large diameter snags and CWD. Such a habitat would support diverse riparian-dependent populations of plants, invertebrates and vertebrates.

Appendix B-4

Riparian Reserve Treatment Comparison

In order to compare results of the proposed treatments versus no treatment, the stands were modeled using ORGANON, SMC version 1.0, a growth and yield model developed by OSU. Numbers generated by growth and yield models can be used as a relative comparison of treatments in a given stand, but are not necessarily accurate predictions of future growth. Future stand measurements are dependent upon disturbance patterns and other stochastic events which can never be accurately predicted. Numbers differ from those generated by SPS (used in Silvicultural prescription) due to differing assumptions and growth equations.

Sale Unit	**Riparian Reserves Acres**		**Age**	**RD[1]**	**QMD[2]** (inches)	**Trees/Acre** (Conifer/ Hardwood)	**Mean Crown Ratio** (%)	**Age QMD > 20.0"**	**Cum. Mortality/ Acre**	**Avg. Snag/CWD[3] DBH** (inches)
1	Alt A: 27 Alt B: 19 Alt C: 33	**Original Stand**	44	.53	14.6	131 /19	55			
		Proposed Treatment	44	.43	16.0	86 / 19	55			
		No Treatment	84	78	19.8	117 / 18	31	89	13.1	14.6
		With Treatment	84	.67	21.9	82 / 18	34	69	3.8	17.0
2	40	**Original Stand**	48	.84	12.1	320	26			
		Proposed Treatment	48	.39	16.0	97	33			
		No Treatment	88	.87	18.3	172	17	103	148.3	10.7

Sale Unit	Riparian Reserves Acres		Age	RD[1]	QMD[2] (inches)	Trees/Acre (Conifer/ Hardwood)	Mean Crown Ratio (%)	Age QMD > 20.0"	Cum. Mortality/ Acre	Avg. Snag/CWD[3] DBH (inches)
		With Treatment	88	.65	22.5	91	20	73	5.2	18.5
3	24	**Original Stand**	47	.67	12.5	239 / 4	52			
		Proposed Treatment	47	.40	16.6	88 / 4	60			
		No Treatment	87	.83	15.8	205 /4	31	102	70.0	10.3
		With Treatment	87	.69	23.7	87 / 4	37	62	.03	19.3
4/6	30/4	**Original Stand**	58	.97	12.3	334 / 28	23			
		Proposed Treatment	58	.51	16.4	93 / 28	31			
		No Treatment	98	.91	18.6	149 / 25	21	113	189.9	10.2
		With Treatment	98	.73	21.4	87 / 25	23	88	6	18.2

Sale Unit	Riparian Reserves Acres		Age	RD[1]	QMD[2] (inches)	Trees/Acre (Conifer/ Hardwood)	Mean Crown Ratio (%)	Age QMD > 20.0"	Cum. Mortality/ Acre	Avg. Snag/CWD[3] DBH (inches)
5	8	**Original Stand**	67	.62	15.9	153	29			
		Proposed Treatment	67	.31	22.3	44	38			
		No Treatment	107	.71	20.9	113	20	102	39.5	11.6
		With Treatment	107	.43	27.7	107	30	67	.36	24.1

1. RD (relative density) is a ratio: trees per acre in a stand adjusted to a 10 inch diameter, divided by the trees per acre of a fully stocked stand 10 inches in diameter (595 for Douglas-fir). 0.35 is the point where growth slows from competition. 0.6 is the point where competition begins to cause mortality.
2. QMD = quadratic mean diameter, the DBH of the tree of mean basal area.
3. The number of snags and CWD reflect model runs, not any planned creation of snags/CWD.

Appendix B-5

Guidelines to Reduce Bark Beetle Mortality

The following guidelines (From Hostetler, B. and D. Ross, 1996, *Generation of Coarse Woody Debris and Guidelines for Reducing the Risk of Adverse Impacts by Douglas-fir Beetle*. [Westside Forest Insect and Disease Technical Center. Unpublished.]) should be followed to reduce the prob-ability of Douglas-fir bark beetle (DFB)-caused mortality of residual standing trees in westside forests where live Douglas-firs are being felled for CWD

- Fell and leave the minimum number of trees possible that will allow achievement of CWD objectives. Remember, the rule of thumb is that the number of standing trees killed will be about 60 percent of the number that are felled.

- Fell the trees no earlier than July and no later than the end of September – the later they can be felled during this period, the better. This will help insure that the trees are felled after the primary flight of DFB and that some drying of logs will occur so that the logs will be less suitable as host material the following spring.

- Staggering the years in which trees are being felled may be beneficial if large numbers of trees are being felled and if enough time is left between felling. The time period between tree falling should be at least three years; four would be better. Otherwise, the situation may be exacerbated by allowing beetles to build to even higher population levels.

- Monitor what is happening in these stands with respect to infestation of down logs, and infestation and killing of standing live Douglas-firs. To date, no data have been collected from areas where silvicultural practices such as this have been used, and any information gathered will be useful under the principles of adaptive management.

- If DFB populations are at high levels in the general area because of large amounts of recent blowdown, it would be prudent to postpone felling of CWD trees until populations subsided. This would be two years from the summer in which many discolored trees are present (or four years after the first spring following the blowdown), unless there are large amounts of blowdown in subsequent years. If this is the case, one should wait longer. Once the infested trees discolor, the extent and intensity of the previous year's DFB activity can be estimated using the "Annual Aerial Insect Detection Survey" maps.

- If possible, fell tree species other than Douglas-fir for CWD.

Appendix C-1

Environmental Elements Review Summary

The following table summarizes environmental features which the Bureau of Land Management is required by law or policy to consider in all Environmental Documentation (BLM Handbook H-1790-1, Appendix 5: Critical Elements of the Human Environment). Information in the table applies only to the proposed action.

Environmental Feature	Affected/May Be Affected/Not Affected	Remarks
Air Quality	Affected	See Air Quality, p. 8
Areas of Critical Environmental Concern	Not Affected	
Cultural, Historic, Paleontological	Not Affected	Survey not required per protocol approved Aug. 1998 (contract suspends operations if discovery)
Prime or Unique Farm Lands	Not Affected	None present
Invasive, Non-native Species	Not Affected	Does not introduce new or increase spread of existing non-native species
Environmental Justice	Not Affected	No impact anticipated
Flood Plains	Not Affected	No development in flood plains
Native American Religious Concerns	Not Affected	
Threatened, Endangered, or Special Status Plant Species or Habitat	Not Affected	Surveyed spring and fall of 1996, 98, and 99. No known sites and none located during survey.
Threatened, Endangered, or Special Status Animal Species or Habitat	Wildlife: Affected Fish: Not Affected	Consulted with U.S. Fish and Wildlife Service Oct. 23, 1999. No anadromous fish.
Hazardous or Solid Wastes	Not Affected	

Environmental Feature	Affected/May Be Affected/Not Affected	Remarks
Drinking or Ground Water Quality	Affected	See Water, p. 20
Wetlands or Riparian Reserves	Affected	See Riparian, p.23
Wild and Scenic Rivers	Not Affected	
Wilderness	Not Affected	

Appendix C-2

Glossary of Terms

Silvicultural Treatments

Group selection - A method of regenerating uneven-aged stands in which trees are removed and new age classes are established in small groups.

Single tree selection - A method of creating new age classes in uneven-aged stands in which individual trees of all size classes are removed more or less uniformly throughout the stand to achieve desired stand structural characteristics.

Regeneration Harvest (even-aged management) - A cutting method by which a new age class is created. In Matrix this means retaining six to eight green trees per acre for future snag and coarse woody debris recruitment, to promote multi-storied canopies, and provide shade and suitable habitat for a variety of organisms. An additional four green trees per acre would be retained to meet short- and long-term snag and down woody material requirements.

Commercial Thinning (even-aged management) - A cultural treatment made to reduce stand density of trees, primarily to improve growth, enhance forest health, or to recover potential future mortality. Disease centers and some hardwood patches may be patch cut as part of this treatment. Trees would be sold along with other timber.

Density Management - Same as commercial thinning; however, the goals are to thin to meet objectives other than timber production. Trees are not necessarily always sold but can be if other resource objectives are met.

Sanitation Harvest - The removal of trees to improve stand health by stopping or reducing actual or anticipated spread of insects and/or disease.

Slashing - The cutting of brush species and damaged conifer understory trees after logging. The purpose is to put the material on the forest floor with other logging debris with the intent of performing site preparation and/or planting.

Pile and Burn - The piling of logging slash (debris) by hand or of mechanical means to concentrate the material for burning during wet weather. The piles are generally covered with plastic. This method extends the season by which burning of logging debris can occur.

Broadcast Burn - Allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of fuel hazard or as a silvicultural treatment or both.

Planting - Planting of trees in regeneration harvested or patch cut units. Species planted generally include a mix of species mimicking the harvested trees and those in the surrounding area. Trees usually are 2-0 bare root planting stock.

Logging Systems Terminology

Ground-based Logging - Logging generally permitted on slopes less than or equal to 35 percent slope. Equipment can include rubber tired skidders, crawler tractors, tracked shovel loaders, feller bunchers and/or forwarders, depending on resource objectives. Generally equipment is limited to pre-designated skid trails approved by the government.

Cable - Partial Suspension - Logging that utilizes cable logging equipment. Generally lateral yarding with slackpulling carriages is required as is suspension of one end of the log when yarding to the landing.

Cable - No Suspension - Cable logging where suspension is either not physically possible or required. Generally an area immediately adjacent to landings has no suspension due to the laws of physics.

Road Terminology

Road Renovation - Generally includes blading and shaping of an existing road surface, clearing brush from the edges of the road to improve visibility, and cleaning of existing culverts.

Road Improvement - Generally includes the above, plus the addition of additional rock surfacing, widening of subgrade, replacement or placement of culverts, etc.

Road Decommissioning - Generally includes removal of culverts, re-establishment of natural drainage patterns, ripping of the surfacing and blocking. Seeding of roadbed sometimes accompanies this activity.

APPENDIX C-3

Duffy Creek Riparian Reserve Acres

Alternative A		Section 17				Section 7				Total
		Unit 1	Unit 2	Unit 3	Total	Unit 4	Unit 5	Unit 6	Total	Sec. 7 & 17
Upland	Ground-based Yarding	12	30	33	75	7	0	0	7	82
	Skyline Yarding	0	0	11	11	19	2	1	22	33
	Total	12	30	44	86	26	2	1	29	115
Riparian	Ground-based Yarding	27	40	7	74	0	0	0	0	74
	Skyline Yarding	0	0	17	17	30	8	4	42	59
	Total	27	40	24	91	30	8	4	42	133
TOTAL		39	70	68	177	56	10	5	71	248

APPENDIX C-3

Duffy Creek Riparian Reserve Acres

Alternative B		Section 17				Section 7				Total
		Unit 1	Unit 2	Unit 3	Total	Unit 4	Unit 5	Unit 6	Total	Sec. 7 & 17
Upland	Ground-based Yarding	12	30	33	75	7	0	0	7	82
	Skyline Yarding	0	0	11	11	19	2	1	22	33
	Total	12	30	44	86	26	2	1	29	115
Riparian	Ground-based Yarding	19	40	7	66	0	0	0	0	66
	Skyline Yarding	0	0	17	17	30	8	4	42	59
	Total	19	40	24	83	30	8	4	42	125
TOTAL		31	70	68	169	56	10	5	71	240

Alternative C		Section 17				Section 7				Total
		Unit 1	Unit 2	Unit 3	Total	Unit 4	Unit 5	Unit 6	Total	Sec. 7 & 17
Upland	Ground-based Yarding	13	30	33	76	7	0	0	7	83
	Skyline Yarding	0	0	11	11	19	2	1	22	33
	Total	13	30	44	87	26	2	1	29	116
Riparian	Ground-based Yarding	30	40	7	77	0	0	0	0	77
	Skyline Yarding	3	0	17	20	30	8	4	42	62
	Total	33	40	24	97	30	8	4	42	139
TOTAL		46	70	68	184	56	10	5	71	255

Appendix D-1

Special Attention Species: Plants

Several special attention species were found in the original proposed sale units (including Riparian Reserves). They are listed in the table below which indicate in which planning unit they were found. There were no known sites of any special attention species prior to these surveys.

	Unit #1 Sec. 7	**Unit #1 Sec. 17**	**Unit #2 Sec. 17**	**Unit #3 Sec. 17**
Protection buffer fungi species:				
Otidea onotica	X	X		X
Sarcosoma mexicana		X	X	X
Survey strategies 1 & 3 fungi species:				
Cantharellus formosus	X	X	X	X
Helvella compressa		X		
Survey strategies 3, 3 & 4 fungi species:				
Craterellus tubaiformis	X	X		X
Gyromitra esculenta	X			
Hydnum umbilicatum	X			X
Clavariadelphus sachalinensis	X			
Omphalina ericetorium		X		
Galerina atkinsoniana			X	
Survey strategies 4 bryophyte species:				
Antitrichia curtipendula				X
Survey strategies 4 lichen species:				
Lobaria oregana	X		X	X
Lobaria pulmonaria	X		X	X
Lobaria scrobiculata		X	X	
Nephroma resupinatum	X	X	X	X
Nephroma laevigatum			X	X
Pseudocyphellaria crocata		X		
Pseudocyphellaria anomala		X		X

	Unit #1 Sec. 7	Unit #1 Sec. 17	Unit #2 Sec. 17	Unit #3 Sec. 17
Survey strategies 4 bryophyte species (cont):				
Pseudocyphellaria anthraspis				X
Peltigera collina		X	X	X
Sticta limbata		X		